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THE INVESTIGATION

OF THE

ACTION OF A MODERN WATER TURBINE.

MADE BY

FRED. A. McKAY B.Sc. AND FRED. B. BROWN B.Sc.

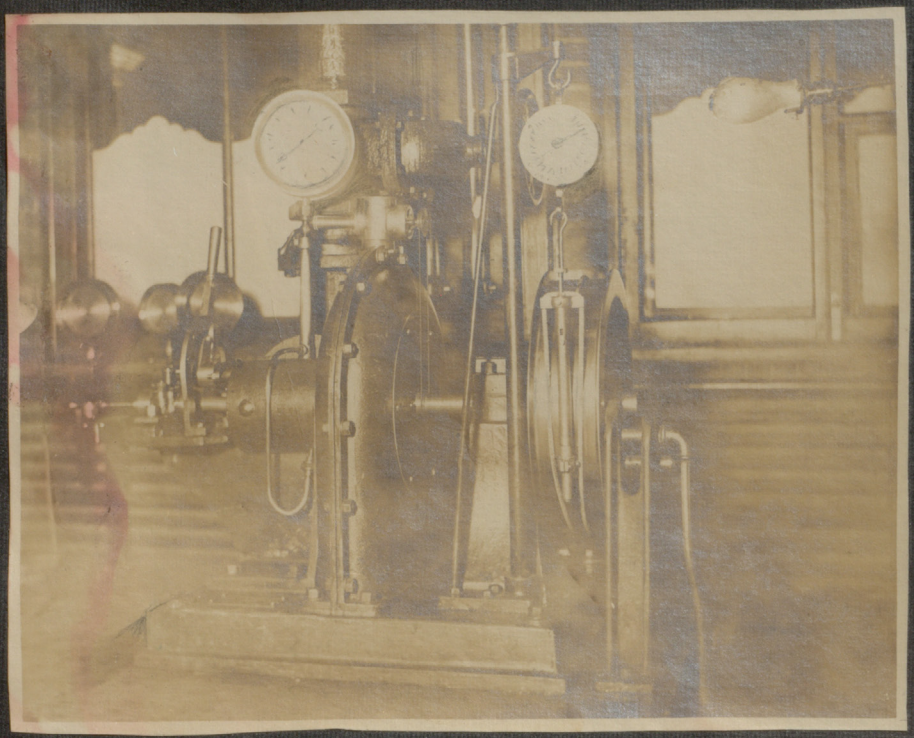
IN THE

HYDRAULIC LABORATORY McGILL UNIVERSITY.

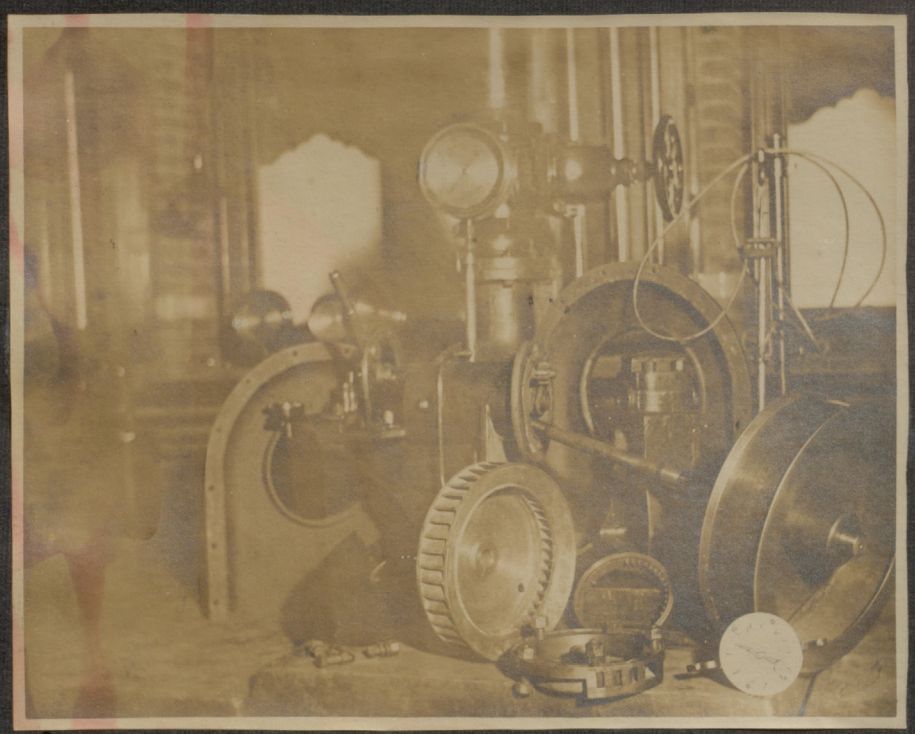
ON THE

GILBERT GILKES' (KENDAL, ENG.) RADIAL OUTWARD FLOW,

FREE DEVIATION TURBINE.



GILKES' TURBINE - ASSEMBLED.



GILKES' TURBINE - APART.

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In order to obtain all the measurements we were obliged to take the whole machine to pieces and by so doing, the drawings show the present actual condition of the turbine rather than the condition planned for, several alterations having

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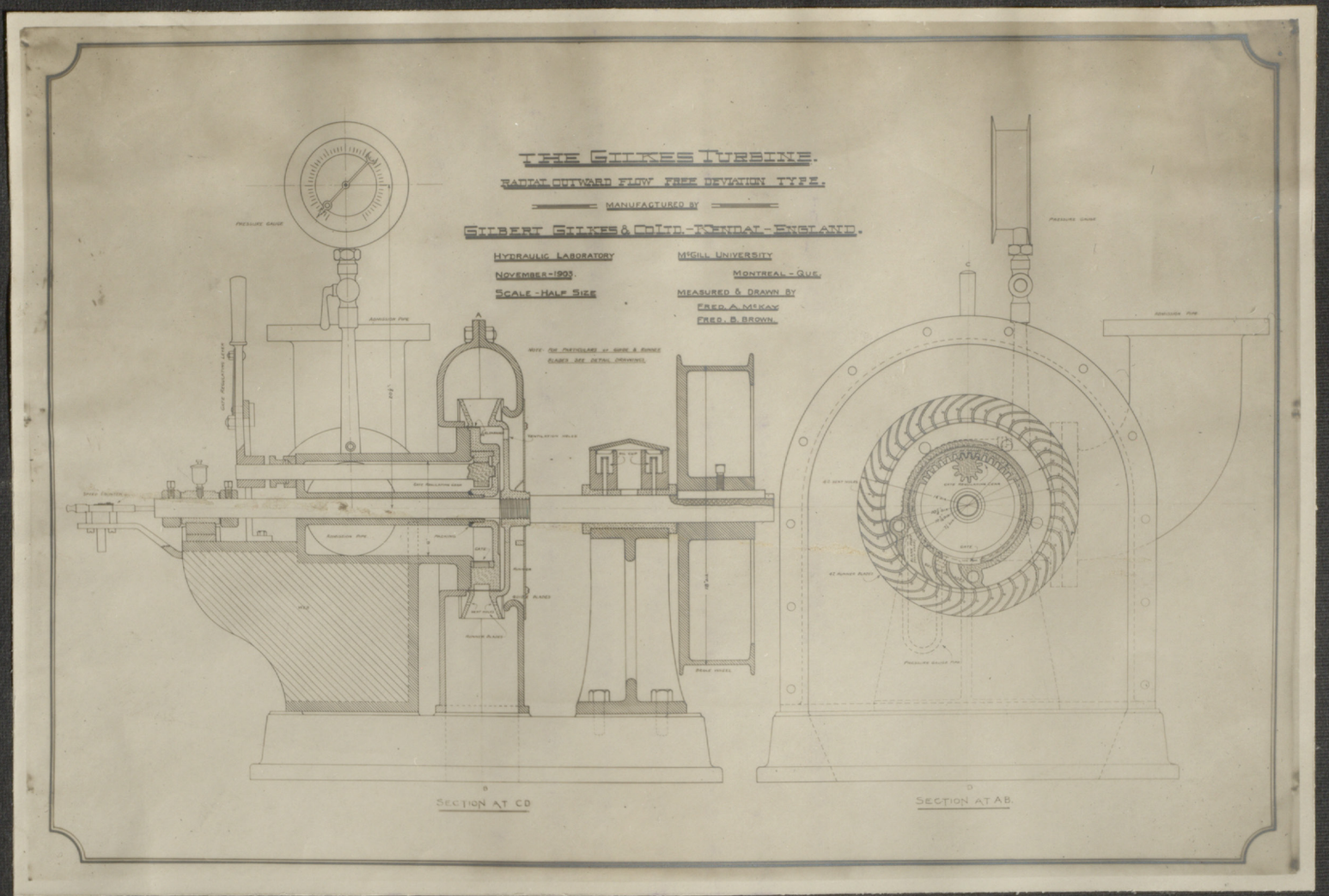


GENERAL ARRANGEMENT of GILKES' TURBINE.

(PHOTOGRAPHED FROM DRAWING)

INVESTIGATION OF THE EFFICIENCY OF A MODERN TURBINE.

OBJECT OF TEST.

The object of the following research was to determine the efficiency of the Gilkes Turbine in the hydraulic laboratory, under various conditions of head, speed, and power developed.

THEORY OF THE RESEARCH.

Turbines have been used for many years to convert more or less of the available energy of a waterfall or rapid into mechanical work. There are two main types,or classes,into which turbines generally may be divided, viz., Reaction Turbines and Impulse Turbines. A reaction turbine acts partly by pressure and partly by kinetic energy. Its guide blades and runner vanes must always be kept full of water (i.e., must have "complete admission"), so as to insure uniformity of pressure throughout the wheel and so maintain the best conditions of working. On the other hand, an impulse turbine receives water at its inlet surface at a velocity due to the total available head, since in this class of wheel all the energy of the water is utilized as kinetic energy. This energy is imparted to the turbine by means of the impulse due to the gradual change of momentum of the entering water. To prevent any change of pressure in the wheel, thus altering its efficiency, care must be taken that the water shall enter and leave the wheel without shock and shall be freely deviated, and also that the buckets or vanes shall never be completely filled. For this reason and also to prevent eddies being formed, holes are pierced just at the back of each vane.

To obtain maximum efficiency it is obvious that the best mechanical construction should be employed, that the water should enter and leave the wheel without losses of head due to shock, and that it should have the easiest possible path while in the turbine. Hence we see that the angles and general shape of the guide blades and vanes must be carefully pre-determined, assuming the head and speed under which the turbine is to work.

The reaction turbine is best adapted for use with low falls and where a large quantity of water is available; while for high falls, the impulse turbine is best, because with a high head the speed of a reaction turbine would be very great, but using an impulse turbine, the dimensions may be so modified that any desired speed may be obtained. The modern impulse turbine, with its specially designed guides and vanes, has been developed from the crude "hurdy-gurdy" wheel of the early mining camps, with its flat vanes and single impinging jet. The following is a short discussion of the fundamental principles which govern the design of a modern turbine.

Let us assume the following notation:-

v_1, v_2, = the absolute velocities of the water at inlet and outlet, respectively.

u_1, u_2, = peripheral speed of turbine at inlet and outlet surfaces, respectively.

V_1, V_2, = relative velocities of the water and the wheel at inlet and outlet.

y, = angle between the direction of the water entering the vanes, and the wheel's periphery at that point.

r_1, r_2, = radii of wheel at inlet and outlet.

A_1, A_2 = areas of wheel inlet and outlet orifices.

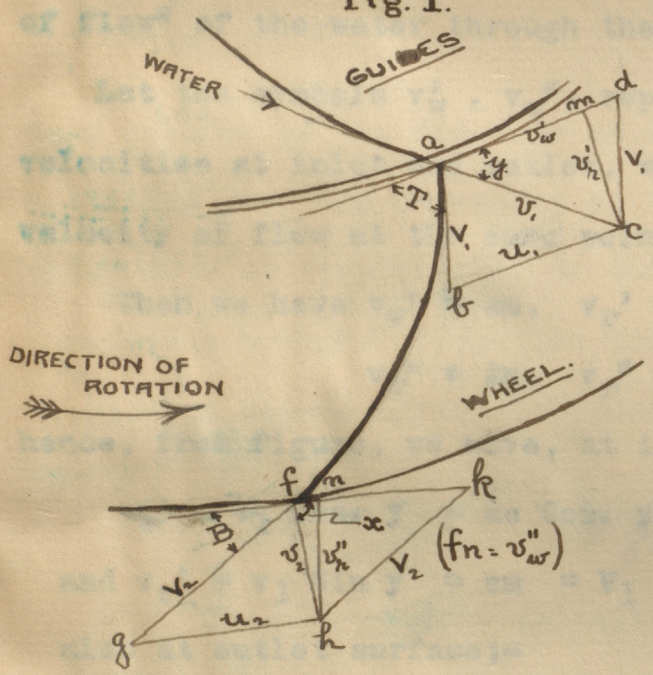
d_1, d_2 = depths of same.

H_1 = effective head under which wheel works.

Q = quantity of water passed per second, measured in cubic feet.

Then considering the following figure, which represents diagrammatically a section through the turbine, let water enter the wheel along ac, tangential to the guide blade. ac makes an angle y with the periphery of the wheel.

Fig. 1.



Let ac represent $v_1 = \sqrt{2gH_1}$, and also let ad drawn tangentially to the periphery at a represent the instantaneous speed of the point a. This is

$$= u_1 = \frac{\pi D_1 N}{60} \text{ feet per second,}$$

where D_1 = the diameter of the wheel at the inlet surface measured in feet, and N = no. of revs. per minute.

Then completing the parallelogram abcd we get ab, the resultant of ac and ad to represent V_1, the relative velocity at inlet. So that there may be no loss due to shock at entrance this line, ab, must be tangential to the surface of the vane at the point a. To prevent loss due to shock at the point of exit f, draw fg tangential to the vane at the point f. This line must represent the relative velocity of the leaving water, = V_2. Also draw fk tangential to the wheel's periphery at f. Then $u_2 = \frac{\pi D_2 N}{60}$.

A_1, A_2 = areas of wheel inlet and outlet orifices.

d_1, d_2 = depths of same.

H_1 = effective head under which wheel works.

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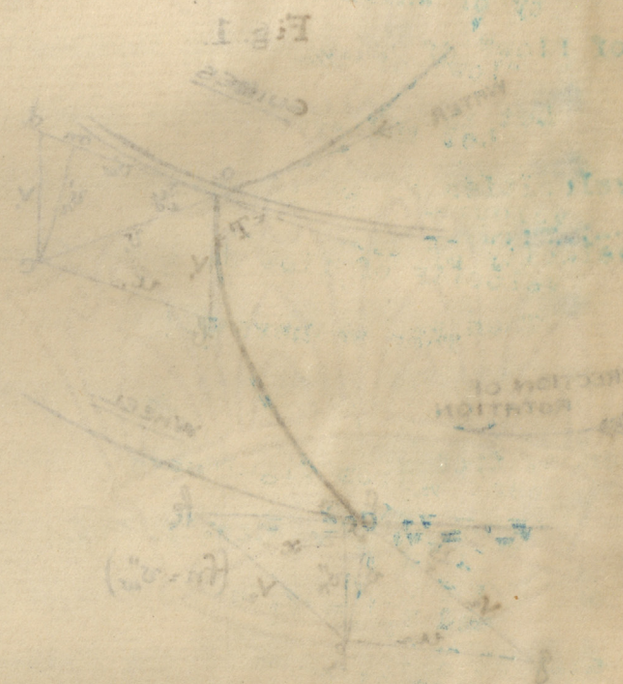
Then considering the following figure, which represents diagrammatically a section through the turbine, let water enter the wheel along ac, tangential to the guide blade. ac makes an angle γ with the periphery of the wheel.



Let ac represent $v_1 = \sqrt{2gH_1}$, and also let ad drawn tangentially to the periphery at a represent the instantaneous speed of the point a. This is

$$= u_1 = \frac{\pi D_1 N}{60} \text{ feet per second,}$$

where D_1 = the diameter of the wheel at the inlet surface measured in feet, and N = no. of revs. per minute.

Then completing the parallelogram $abcd$ we get ab, the resultant of ac and ad to represent V_1, the relative velocity at inlet. So that there may be no loss due to shock at entrance this line, ab, must be tangential to the surface of the vane at the point a. To prevent loss due to shock at the point of exit f, draw fx tangential to the vane at the point f. This line must represent the relative velocity of the leaving water, $= V_2$. Also draw fk tangential to the wheel's periphery at f. Then $u_2 = \frac{\pi D_2 N}{60}$.

Then completing the parallelogram fghk, we get fh = direction and magnitude of the absolute velocity of the leaving water. Call the angle kfh, x.

Draw cm perpendicular to ad and hn perpendicular to fk.

The relative velocity V_1 or V_2 as the water enters or leaves the wheel may thus be divided into two components, tangential and radial to the wheel. The tangential component is called the "velocity of whirl", while the radial component is called the "velocity of flow" of the water through the wheel.

Let the symbols v_w' , v_w'', represent respectively the whirling velocities at inlet and outlet, while v_r' and v_r'' represent the velocity of flow at the same points.

Then we have $v_w' = am$, $v_r' = cm$

$v_w'' = fn$, $v_r'' = hn$

hence, from figure, we have, at inlet surface:-

$v_w' = v_1 \text{ Cos. } y = ac \text{ Cos. } y = am = ad \pm dm = u_1 - V_1 \text{ Cos } T$

and $v_r' = v_1 \text{ Sin } y = cm = V_1 \text{ Sin } T.$

also at outlet surface;-

$v_w'' = v_2 \text{ Cos } x = fn = hk + kn = u_2 - V_2 \text{ Cos } B$

and $v_r'' = v_2 \text{ Sin } x = hn = V_2 \text{ Sin } B.$

Hence from the figure v_w', v_w'', v_r', and v_r'' are readily obtained.

Consider the following figure:-

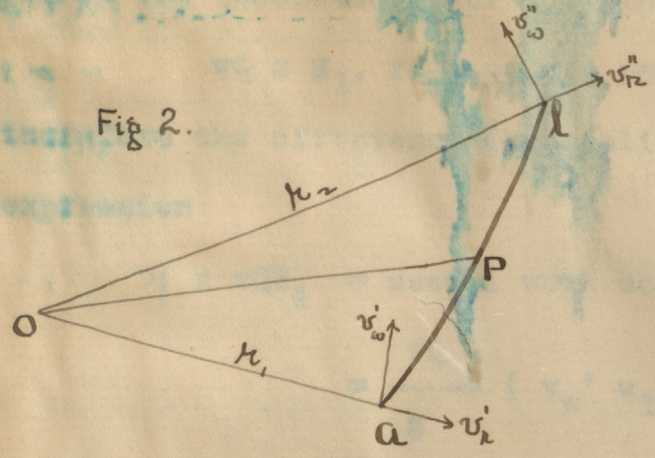


Fig 2.

Let al represent the absolute path of the water through the turbine. From the second law of motion we have that f = m x a, or, that force (or pressure) is measured by the rate at which momentum is being destroyed, or the momentum destroyed per second is a measure of the pressure on the vane at any point P. Now in a turbine the only component of this pressure on the vane is that which acts at right angles to the radius OP. Suppose Q could be completely brought to rest in one second. Then the momentum destroyed and consequently the pressure on the vane at a would be

$$\frac{wQ}{g} \times v_w' ,$$ from the above.

But, since u_1 = velocity of a, the useful work done by the water per second is equal to

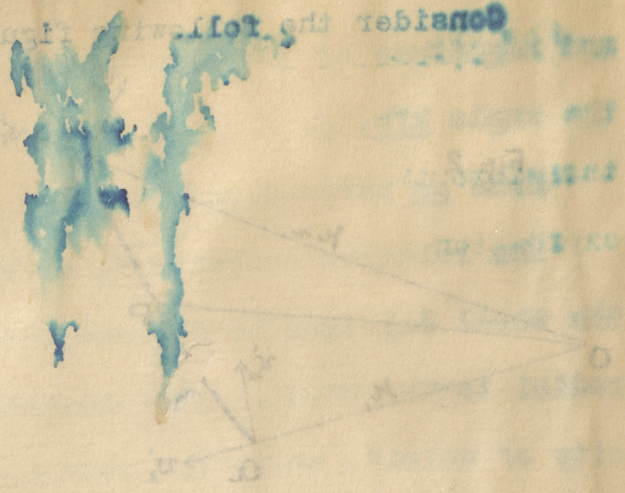
$$\frac{wQ}{g} \times v_w' \times u_1 .$$

Similarly, at l, Q is still capable of doing an amount of

$$\text{work} = \frac{wQ}{g} \times v_w'' \times u_2$$

Hence the useful work done per second by the water on the wheel between inlet and outlet is given by

$$\frac{wQ}{g} (v_w' u_1 - v_w'' u_2),$$ foot pounds per sec.



Now the theoretical work obtainable is given by

$wQ \times H_1$, foot pounds per second.

therefore the efficiency (hydraulic) of the wheel is given by the expression

$$\eta \times wQH_1 = \text{useful work done per second}$$

$$= \frac{w}{g} (v_w' u_1 - v_w'' u_2)$$

$$\text{or } \eta g H_1 = v_w' u_1 - v_w'' u_2$$

Now in an impulse turbine p_1, the inlet pressure, $= p_2$, the outlet pressure, = atmospheric pressure; and also $v_1 = C_v \sqrt{2gH_1}$ and from the figure at the beginning we have in this case

$$\frac{v_2^2 - v_1^2}{2g} = \frac{u_2^2 - u_1^2}{2g}$$

Hence we may pre-determine efficiency, having assumed working head and speed of the turbine.

To get the theoretical maximum efficiency, it is obvious that the whole of the water's energy should be utilized in doing useful work on the wheel and hence that the water should leave the turbine with no velocity. But if the water had no leaving velocity, no water could pass through the wheel and therefore no work could be done. Hence in practice v_2 is made small by adopting one of the following hypotheses, viz.,

either that $v_w'' = 0$

or else that $v_2 = u_2$.

and so by working from figure 1, with either of these suppositions, we may completely design our turbine.

To apply the above reasoning to the actual case under con-

Now the theoretical [illegible] obtainable is given by

$w_0 \times H_1$, [illegible] per second.

therefore the efficiency (theoretical) of the wheel is given by the expression

$$\eta_1 \times w_0 H_1 = \text{useful work done per second}$$

$$= \frac{w_0}{g} \left(v_w{}' u_1 - v_w{}'' u_2 \right)$$

$$\text{or } \eta_1 g H_1 = v_w{}' u_1 - v_w{}'' u_2 .$$

Now in an impulse turbine p_1, the inlet pressure $= p_2$, the outlet pressure $=$ atmospheric pressure; and also $v_1 = 0$, $v = \sqrt{2gH_1}$

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To apply the above reasoning to the actual case under con-

sideration is the next step. From data supplied by the manufacturers we find that the turbine was designed to run at 780 revs. per minute under a working head of 112 feet, and from very careful drawings made of the turbine the following data were obtained.

$\frac{D_1}{2} = r_1 = 5.25"$ $\quad T = 108^\circ$ $\quad y = 26^\circ 21'$

$\frac{D_2}{2} = r_2 = 7.00"$ $\quad B = 30^\circ$

Hence $u_2 = \frac{\pi D_1 N}{60} = \frac{22}{7} \times \frac{10.5}{60} \times \frac{780}{12} = 35.7$ ft./sec.

and $u_2 = \frac{\pi D_2 N}{60} = \frac{22}{7} \times \frac{14}{60} \times \frac{780}{12} = 47.6$ ft./sec.

Now $v_1 = C_v\sqrt{2gH_1} = .94 \times \sqrt{64.4 \times 112}$

$= 80$ ft. per second.

Now

$V_1^2 = u_1^2 + v_1^2 - 2u_1 v_1 \cos y$

$= 35.7^2 + 80^2 - 2 \times 35.7 \times 80 \times .8961$

$= 1274 + 6400 - 5120$

$= 2554$

$\therefore V_1 = 50.6$

Similarly, from $V_2^2 - V_1^2 = u_2^2 - u_1^2$

we get $V_2 = 59.6$

Hence breaking up V_1 and V_2 into their tangential and radial components, we get that

$V_w' = 71.7$ ft./sec. and $V_w'' = -4$ ft./sec.

substituting in our fundamental equation we get

$$\text{efficiency} = \frac{v_w' u_1 - v_w'' u_2}{gH_1}$$

$$= 78\ \% \text{ approximately.}$$

This is disregarding hydraulic and mechanical losses. From consideration of data from a number of tests and tables it was decided that the main sources of loss were as follows:

(a) Loss due to shock at entrance to wheel.

(b) Loss due to water friction in passing through the wheel.

(c) Loss due to bearing and journal friction.

From the mean of a number of tables the sum of these losses was taken as about 20 %, making the expected efficiency at 780 r.p.m. and 112 feet, about 58 %. There was not sufficient time to thoroughly investigate all these losses, but from the experiments we found that the efficiency at this head and speed was about 57 %, showing that the calculated values agreed very closely with the experimental value.

APPARATUS.

The Gilkes turbine is of the radial outward flow type. It consists essentially of a wheel which carries 42 blades, bent to the proper curve, as shown in the accompanying drawing.

The water enters the turbine chamber from the back, in a horizontal direction. From the turbine chamber it is admitted to the runner blades, through either one, two or three gates, (or guide blades,) as the case may require. After passing through these blades, it drops down with little or no energy and is discharged through the bottom of the turbine into a tank.

THE ADMISSION PIPE is 6 inchss in diameter and is made of

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(b) Loss due to water friction in passing through the wheel.

(c) Loss due to bearing and journal friction.

From the mean of a number of tables the sum of these losses was taken as about 20 %, making the expected efficiency at 750 r.p.m. and 112 feet, about 59 %. There was not sufficient time to thoroughly investigate all these losses, but from the experiments we found that the efficiency at this head and speed was about 57 %, showing that the calculated values agreed very closely with the experimental value.

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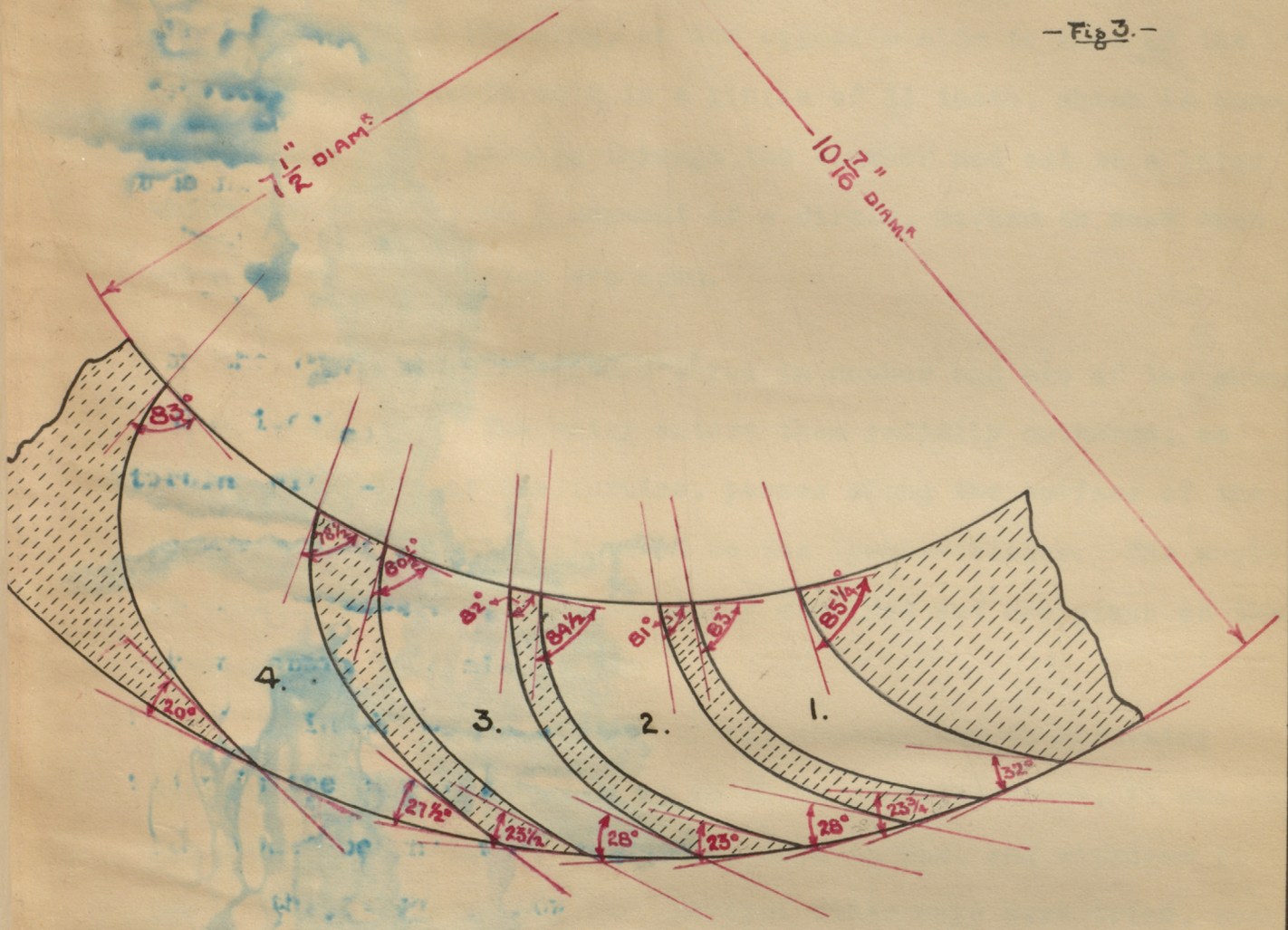
THE ADMISSION PIPE is 6 inches in diameter and is made of

ordinary cast iron, and is not machined, being left in its rough state.

THE TURBINE CHAMBER is of cylindrical form, of the same size as the admission pipe (6 inches diam.) and is likewise of cast iron, unmachined. Through the centre of this chamber there is a 2 1/8 inch pipe, which protects the axle from water. One suggestion which was made was to put a piece of iron in the chamber at the end farthest from the wheel, of such a shape, and in such a position, that it would direct the water from the inlet pipe along the axis of the turbine without undue shock and consequent loss, caused by the present sharp corners. This was not tried, however, in this set of trials, owing to the difficulty of construction and of taking the turbine apart, and also as it was doubted if much advantage would be gained in this particular case, owing to the slow velocity of the water in the chamber. It is not difficult to see how slow this velocity would be when we compare the cross-section of the gates with that of the chamber. However, in a different sized turbine, or one of different design, it would probably form an item which would be well worth considering.

THE ADMISSION GATE, together with its shifting gear, is very clearly shown in the accompanying large drawing. It consists of a ring of brass, which is machined so as to slide on the inner surface of the guide blades. At a certain point there is an opening cut in the brass ring, 1 inch wide by slightly over 2 1/2 inches long. This opening forms the orifice through which the water passes from the turbine chamber to the guide blades. The gate may be rotated so that water will be admitted to all three, two, or one

— Fig 3. —



DETAILS OF GUIDE-BLADES OF GILKES TURBINE

FULL SIZE

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BLADE	INLET ANGLES BACK	INLET ANGLES FRONT	OUTLET ANGLES BACK	OUTLET ANGLES FRONT	DEPTH OF OPENING
4.	83°	78½°	20°	27½°	1"
3.	80½°	82°	23½°	28°	1"
2.	84½°	81°	23°	28°	1"
1.	83°	85¼°	23¾°	32°	1"

BROWN AND McKAY, '03

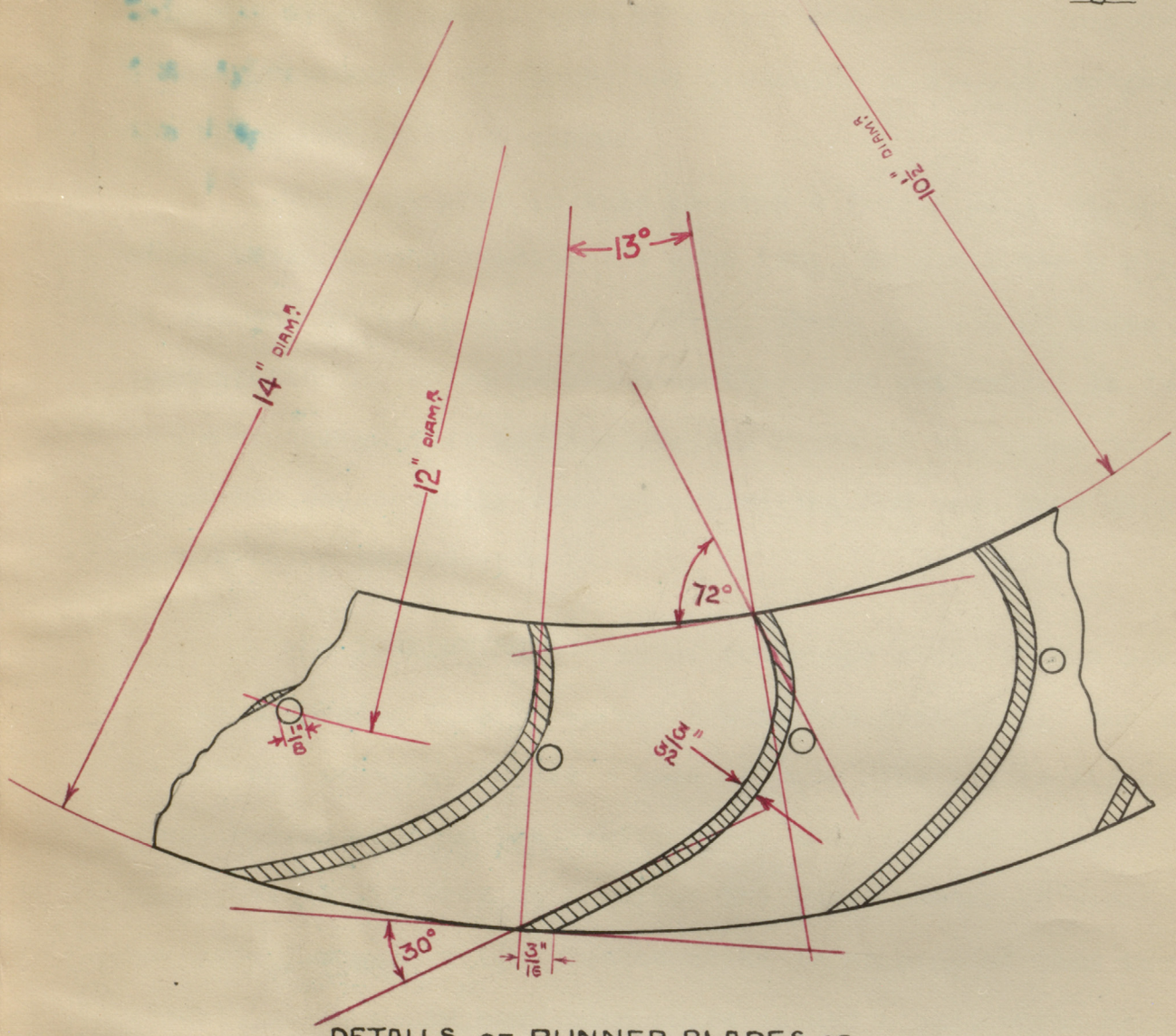
of the blades, or finally the passage may be entirely closed.

To rotate this gate, a series of 15 teeth are placed on the inner side of the ring, on the opposite side to that of the orifice. These teeth work in a pinion of 11 teeth, which is connected to a shaft passing through the chamber and out to a lever which operates beside a segment of a circle, marked to show when one, two or three gates are open.

THE GUIDE BLADES are three in number and are of the shape shown in Fig. 3 . The water enters them radially outwards, as regards the axis of the turbine, passes along the surface of the blade and is finally delivered to the runner blades. The angles of these blades were very carefully obtained and are given on the drawing Fig. 4.

Considerable difficulty was experienced in obtaining accurately their shape. Owing to their peculiar shape, it was impossible to melt in any substance, such as wax, and withdraw it again without destroying it. Several other ways were tried, such as:- (1) Accurately bending electric fuse wire round the curves, withdrawing it, and carefully marking its shape on paper. (2) Hammering in lead. (3) Squeezing in wet cardboard. (4) Taking offsets from a port; but all proved inaccurate. We finally cut pieces of tinfoil to approximately the size and shape of the blades; as the sides of the guides are perpendicular to the surfaces of the blades, it was possible to put this tinfoil against the sides and work it up to the blades with a sharp knife. Now by slipping a knife under the foil you could give it a slight twist which would enable the piece to be withdrawn from the passage. When this was done, the foil was again flattened out

Fig 4.



DETALLS OF RUNNER BLADES OF

GILKES TURBINE

FULL SIZE

McGILL UNIVERSITY HYDRAULIC LAB.

NOV. 1903

THERE ARE 42 RUNNER BLADES OF DIMENSIONS AS SHOWN, THE INSIDE FACE OF EACH BLADE SUBTENDS AN ANGLE OF 13 DEGREES AT THE CENTRE OF THE RUNNER. INLET TIP ANGLE = 72°. OUTLET TIP ANGLE = 30°.

BROWN AND McKAY '03

carefully and we had an accurate shape of the guide passage. This was at once transferred to paper, from which the angles were finally measured. Of course the distances along the periphery of the wheel had to be obtained.

There is also in this machine a fourth port, which is never used. If we examine the gate ring, we shall see a place, at the end of the admission orifice, where a piece of brass has been brazed in, so as to close up this port entirely. In fact it looks as though this machine was the first of its class to be built and consequently some experimenting had been done upon it before being turned out.

THE TURBINE RUNNER is of the shape shown in the drawing. [Fig 4] It has 42 blades equally spaced aroung its periphery. The wheel is not one casting, but is a made up one. The blades are cut from sheet brass, bent to the proper shape and soldered in place. This fact, especially when we consider the large number of blades, accounts for some slight inaccuracies in spacing of these blades, which would have been obviated had a cast wheel been employed. It is also due to this, to some extent we believe, that the efficiency of the wheel is so low.

VENTILATION OF THE WHEEL. Three 5/8 inch holes are provided in the end of the wheel to allow the admission of air to the int erior. Also there are two 1/8 inch holes, one at each side of each blade, to allow for ventilation.

CASING. The whole machine is enclosed in a cast iron case, which is supported on the bed plate. The orifice for the discharge of water is located at the bottom. The design of this

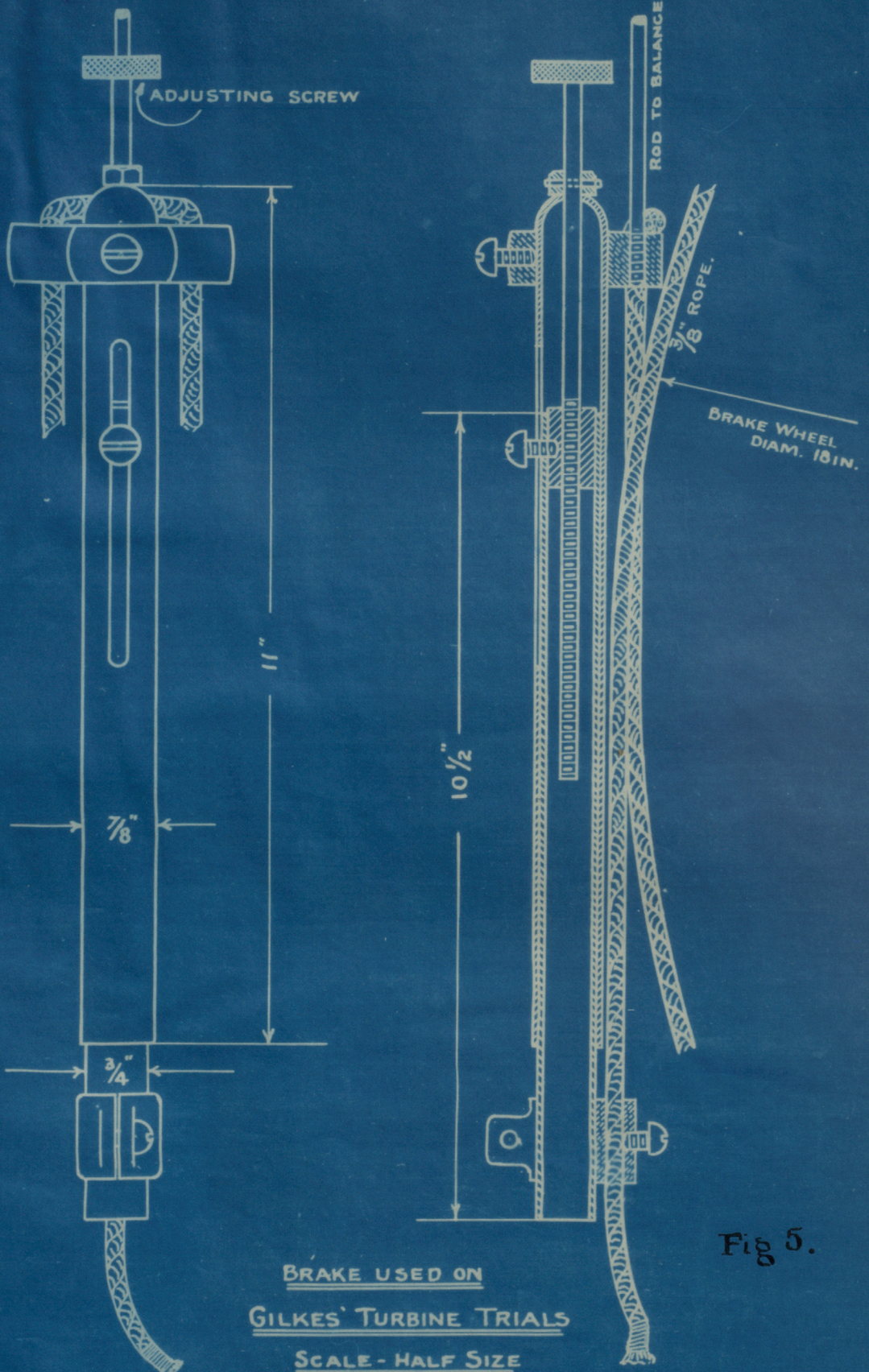


Fig 5.

BRAKE USED ON

GILKES' TURBINE TRIALS

SCALE - HALF SIZE

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casing would be much improved if it was made to open by raising the top section instead of removing the whole side as at present. As the turbine is constructed now, in order to get at the inside it is necessary to take nearly the whole machine to pieces.

AUXILIARY APPARATUS.

TANKS. The water, which was used during the trial, was caught in two tanks located below the floor. Each of these tanks held about eleven hundred gallons. They were filled simultaneously.

PRESSURE GAUGE. The gauge used to measure the head of water was Crosby No. 456670, range 0-160 lbs. We accurately calibrated this gauge on the Crosby Gauge Calibrating apparatus in the Testing Laboratory and obtained a curve showing the correction to be made in the readings.

BRAKE. In Figure 5. is shown a drawing of the brake used. It is remarkably sensitive in its action and answered perfectly to the slightest adjustment. It is of the type which requires only one spring balance, the effective brake pull being read directly on one balance instead of on two, as is usually the case.

BRAKE WHEEL. This wheel is 18 inches in diameter, and is shown in the general arrangement view. At the higher heads it got quite hot, so it was necessary to pour a stream of cold water constantly on the inside. The force of this stream was reduced for the lower heads, owing to the fact that the force of

water impinging was quite considerable, compared to the force driving the wheel. In order to keep the rope from sticking, the surface of the wheel was kept constantly wiped off with a coal-oiled rag.

THE SPRING BALANCE, which registered the pull of the brake, was calibrated previously by suspending known weights on it. An initial weight equivalent to that of the brake, with its ropes on the wheel, but hanging loosely, was hung on the balance and the pointer was then placed at zero. In this way we obtained directly the pull due to torque.

SPEED COUNTERS. Constant speed was indicated approximately by means of a tachometer, which was driven by a belt from the turbine shaft. This, however, was only a rough method, so we took the speed by means of an ordinary revolution counter, which was attached to the end of the shaft, and is shown in our drawing. From this we obtained the total number of revolutions during a trial.

METHOD OF CARRYING ON TRIALS.

The general principle which was adopted in running these trials was to keep the speed constant by adjusting the brake pull; and to keep the head of water constant by opening or closing the admission valve.

The series of trials were run at speeds varying from 400 to 1000 revs. per min. (intervals of 100 r.p.m. being taken). At each speed the head was varied from zero to 100 lbs. (as read on

the gauge). All this was repeated three times:- (1) with three gates open; (2) with two gates open; (3) with one gate open.

To run the trials, the water was first turned on till the desired head was reached. When this was done, the speed was regulated till it was correct, by applying load to the brake wheel, or removing it, as the case might require. Sufficient time (which was not necessarily very long) was given for all governing factors to become constant before the trial was started. When everything was ready, at a given signal, the speed counter was shoved in, and the ~~exit~~ weir gate, which directed the water into the tanks, was closed down. During the trial, brake load readings were taken at short intervals of time, so as to get the average brake pull during the trial.

At the close of the trial, at a given signal, the speed counter was removed, and the weir gate was opened up, allowing the water to run to waste again. The total number of revolutions were divided by the time, and the revolutions per minute thus obtained. The quantity of water which went into the tanks was measured after the trial was completed. This was the procedure with each trial. From the results thus obtained we were able to get the Indicated Horse Power from

$$I.H.P. = \frac{w \times Q \times H}{33000}$$

where w = Weight of 1 cu.ft. of water.

Q = Cu.ft. of water passed per minute.

H = Head of water in feet.

Also the Brake Horse Power from

$$B.H.P. = \frac{P \times 2\pi r n}{33000}$$

where P = Pull of brake.

r = Effective radius (including rope) of brake wheel.

n = Number of rev./min.

Having thus obtained the I.H.P. and B.H.P., the Efficiency naturally follows from

$$\text{Efficiency} = \frac{B.H.P.}{I.H.P.}$$

CURVES PLOTTED.

The curves plotted were:-

(1) I.H.P., B.H.P. AND EFFICIENCY ON A HEAD (IN FEET OF WATER) BASE. This was done for speeds of 400 r./m. to 1000 r./m.

These curves show that the I.H.P. is practically the same for all speeds of the turbine for a particular head, but that it rises, as would be expected, as the head of water increases; and at high heads rises more rapidly than at low heads. The B.H.P. is a straight line, showing that if the speed is kept constant, the horse-power varies directly as the pull, and therefore directly as the head of water. These curves become steeper as the speed increases.

The efficiency curves show that at low speeds the efficiency rises much more rapidly to its maximum as the head increases than at high speeds, but that it also falls off more rapidly. Probably the most important point which can be gathered from these curves

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is, that with a given speed there is some head at which the turbine is most efficient. If the curves be examined carefully, it will be found that at 780 R./m. and 110 ft.-head, the turbine reaches that point. This is just about the point given by the manufacturers as the point at which the turbine would do its best work. The same curves were plotted for the machine when running with two gates open and one gate open, respectively. In comparing these three sets of curves, it is noticed that the two latter fall very much below the first one, which is what would be expected.

(2) I.H.P., B.H.P. AND EFFICIENCY ON A SPEED BASE.

These curves show that, as the speed increases, the I.H.P. remains almost constant for a given head, if anything, rising slightly with the speed.

The B.H.P. curve is rounded, showing that there is some speed, (for each head), at which the best B.H.P. is obtainable. These limits of speed do not show the full curve, and therefore the maximum point is not always reached. This speed is lower at low heads than at high ones.

The Efficiency curve follows the general direction of the B.H.P. curve, as might be looked for when the I.H.P. is almost constant.

What was said regarding the curves on a head base, with one and two gates open, may also be repeated in this case. We were able to plot all the one gate curves on one sheet, so that an excellent comparison is obtained by looking at the curves on that sheet.

(3) MAXIMUM EFFICIENCY ON A SPEED BASE.

This again shows the best speed and head of the turbine. The small figures give the head at which this efficiency was obtained. The maximum efficiency here plotted is that considered only up to the limits of head which were worked with. Hence the curves would assume a somewhat different form had the speed been carried higher.

(4) HEAD REQUIRED TO RUN TURBINE AT DIFFERENT SPEEDS WITHOUT OUTSIDE LOAD.

These curves show what head is required to overcome the friction of the machine, windage, etc., when there is no load on the brake wheel. It is interesting to note that over two-thirds of the power at 1000 r./m. with one gate open is wasted in maintaining this speed.

In some of the curves, some points will be noticed to be slightly off the lines. This is due to unavoidable inaccuracies in the readings of some of the instruments; such as, for example, the brake balance which could not be read to much closer than a quarter of a pound, while if we tried to replace this balance by a more sensitive one, the vibrations of the needle would be so great, owing to the light springs, that the readings would not be more accurate than before. Most of the points fell very close to the mean line drawn through them. In the case of plotting a curve, such as an efficiency curve, the curve was developed from the points which were obtained from the trials, but if these points fell off either the I.H.P. or B.H.P. curves, the efficiency was obtained from values taken from the curves rather than from

our points, and our points were plotted as well.

The first method adopted was to obtain the mean value from three trial trials run at the same speed and head. This was adhered to for some time, but was soon seen to be unnecessary as the trials were coming out with almost identical values. The number was therefore reduced to two similar trials; which method would have proved very satisfactory (although somewhat laborious), had not a complaint come from the governors of the college, regarding the amount of water which was being used in the Hydraulic Laboratory. It was therefore considered expedient to find some other method. The one adopted was to run only one trial at each speed and head; to run all the trials at a certain speed together, and to plot our results as we went along. As the B.H.P. would lie on a straight line, and as the I.H.P. would be on a regular curve, which would just about repeat itself in the next set of readings (at a different speed) it is easily seen that the points would check each other, and that even a very slight error would be soon located. If such an error was found (if it amounted to anything) the trial was repeated, special attention being paid to that part where the error was thought to exist. If an error was found in our first readings, the second results were put in place of our first ones.

Another way to reduce the amount of water used was to shorten the time of each trial. The first trials lasted for ten minutes, but it was found that the tanks would not hold enough water for this in some trials, so to maintain uniformity, it was thought as well to run all the trials for eight minutes.

Engineering Library

In this set of turbine trials, the machine has been dealt with rather as a commercial article than as a scientific piece of apparatus. It would have been exceedingly interesting and profitable to have tried to trace out where the different losses occurred, whether they were due to friction, eddy currents in the water due to shock, or windage, or if they could be traced to the poor construction of the wheel proper or any part of the piping leading to it. While such a treatment as this would give most useful information no doubt, still it is feared the limits of time, and the large quantity of apparatus which would be required, prevent such a discussion in this paper.

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CURVES OF

MAXIMUM EFFICIENCY

—ON—

SPEED BASE.

1, 2 AND 3 GATES OPEN.

CURVES OF

MAXIMUM EFFICIENCY

ON

SPEED BASIS.

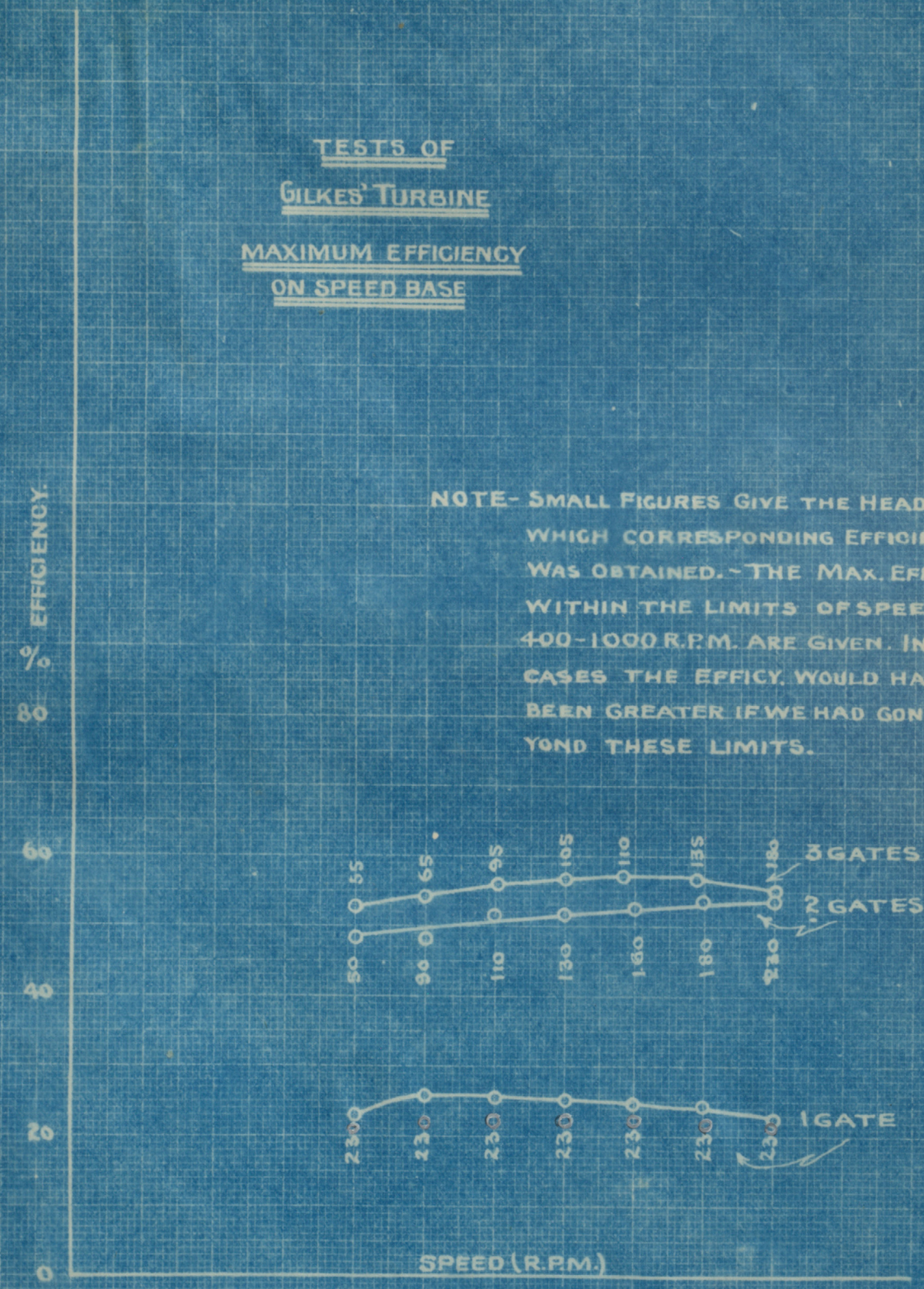
1, 2 AND 3 GATES OPEN.

THIS MARGIN RESERVED FOR BINDING.

TESTS OF GILKES' TURBINE

MAXIMUM EFFICIENCY ON SPEED BASE

NOTE- SMALL FIGURES GIVE THE HEAD AT WHICH CORRESPONDING EFFICIENCY WAS OBTAINED.- THE MAX. EFFICY. WITHIN THE LIMITS OF SPEED OF 400-1000 R.P.M. ARE GIVEN. IN SOME CASES THE EFFICY. WOULD HAVE BEEN GREATER IF WE HAD GONE BEYOND THESE LIMITS.



CURVES SHOWING

HEAD REQUIRED TO RUN THE TURBINE

AT DIFFERENT SPEEDS WITHOUT LOAD

1, 2 & 3 GATES OPEN.

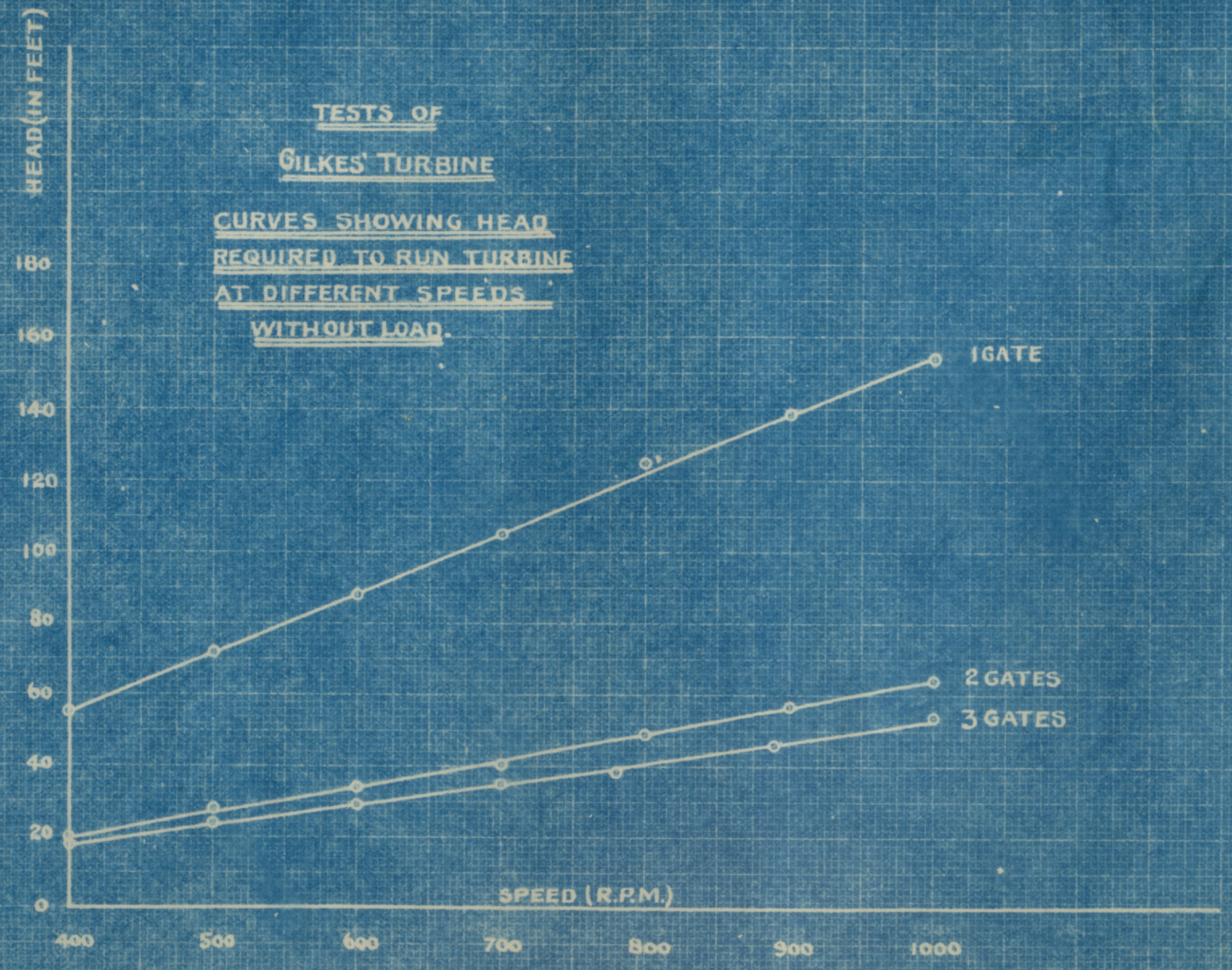
THIS MARGIN RESERVED FOR BINDING.

IF SHEET IS READ THIS WAY (HORIZONTALLY), THIS MUST BE TOP.
IF SHEET IS READ THE OTHER WAY (VERTICALLY) THIS MUST BE LEFT-HAND SIDE.

TESTS OF

GILKES' TURBINE

CURVES SHOWING HEAD REQUIRED TO RUN TURBINE AT DIFFERENT SPEEDS WITHOUT LOAD.



DEPARTMENT OF ELECTRICAL ENGINEERING - MC GILL UNIVERSITY

RESULT SHEETS OF

TRIALS ON THE TURBINE

— WITH —

THREE (3) GATES OPEN

McGILL UNIVERSITY.

HYDRAULIC LABORATORY.

Montreal, December 1903

of Gilkes Turbine

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
3·30	#2			14·5	20	0
5·30	725·3			14·5	20	
7·30				14·5	20	
9·30	#5			14·5	20	
1·30	407			14·5	20	
3·30				—	20	4025
	1132·3					

Test No. 40

Average Pressure } 20 lbs./□"

Equivalent Head; Corrected } 47·6 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 1·637

Average effective brake pull (T_1-T_2) } 14·5 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 402·5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= ·848

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 51·8 %

arks:

IME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
53·30	#2			14·5	20	0
55·30	720·7			14·5	20	
7·30				14·5	20	
9·30	#5			14·5	20	
1·30	412·8			14·5	20	
3·30				—	20	3990
	1133·5					

Test No. 41

Average Pressure } 20 lbs./□"

Equivalent Head; Corrected } 47·6 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 1·64

Average effective brake pull (T_1-T_2) } 14·5 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 399

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= ·841

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 51·3 %

arks:

Mean η = 51·5%

Test of

TIME	
12.30	
14.30	
16.30	
18.30	
20.30	
22.30	

Remarks:

TIME	
11.34	
.36	
.38	
.40	
.42	
.44	

Remarks:

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HYDRAULIC LABORATORY.

Montreal, December 1903

of Gilkes Turbine

IME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
2·30	#2			19·7	25	0
4·30	748·3			19·7	25	
6·30				19·7	25	
8·30	#5			19·7	25	
10·30	493			19·7	25	
12·30				—	25	4005
	1241·3					

arks:

Test No. 42

Average Pressure } 25 lbs./□"

Equivalent Head; Corrected } 58·35 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 2·193

Average effective brake pull (T_1-T_2) } 19·7 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 400·5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 1·147

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 52·3 %

IME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
34	#2			20·0	25	0
36	750·5			20·1	25	
38				19·7	25	
40	#5			20·0	25	
42	495·5			19·9	25	
44				—	25	3950
	1246					

arks:

Test No. 43

Average Pressure } 25 lbs./□"

Equivalent Head; Corrected } 58·35 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 2·2

Average effective brake pull (T_1-T_2) } 19·94 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 395

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 1·148

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 52·2 %

Test of G

TIME	Amou... Water... (gall...
11·57	# 2
·59	78
12·01	
·03	# 5
·05	57
·07	
	135

Remarks:

TIME	Amount... Water U... (gallons)
12·29	# 2
·31	783
·33	
·35	# 5
·37	562
·39	
	134

emarks:

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Montreal, December 1903

t of Gilkes Turbine

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
57	# 2			25·5	30	0
59	784			26·0	30	
01				25·5	30	
03	# 5			25·0	30	
05	572·5			25·5	30	
07				—	30	3990
	1356·5					

Test No. 44

Average Pressure } 30 lbs./□"

Equivalent Head; Corrected } 70·5 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 2·895

Average effective brake pull (T_1-T_2) } 25·5 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 399

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 1·479

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 51·1 %

narks:

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
29	# 2			25·5	30	0
31	783			25·5	30	
33				25·5	30	
35	# 5			25·5	30	
37	562			25·5	30	
39				—	30	4005
	1345					

Test No. 45

Average Pressure } 30 lbs./□"

Equivalent Head; Corrected } 70·5 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 2·88

Average effective brake pull (T_1-T_2) } 25·5 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 400·5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 1·482

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 51·5 %

narks:

Mean η = 51·3%

Test of

TIME
9·37
·39
·41
·43
·45
·47

Remarks:

TIME
9·58·30
10·00·30
·02·30
·04·30
·06·30
·08·30

Remarks:

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Montreal, December 1903

of Gilkes Turbine

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
37	#2			30·5	35	0
39	829.1			30.5	35	
41				30.5	35	
43	#5			30.5	35	
45	647.2			30.5	35	
47				—	35	4005
	1476.3					

Test No. 46

Average Pressure } 35 lbs./□"

Equivalent Head; Corrected } 82 ft.

Total time 600 secs.

I. H. P. = Head x pounds water used. / Time in secs. x 550.

= 3.665

Average effective brake pull (T_1-T_2) } 30.5 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 400.5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 1.775

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 48.5 %

arks:

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
38.30	#2			31.0	35	0
40.30	829.1			30.7	35	
2.30				30.7	35	
4.30	#5			31.0	35	
6.30	657.4			31.0	35	
8.30				—	35	3998
	1486.5					

Test No. 47

Average Pressure } 35 lbs./□"

Equivalent Head; Corrected } 82 ft.

Total time 600 secs.

I. H. P. = Head x pounds water used. / Time in secs. x 550.

= 3.69

Average effective brake pull (T_1-T_2) } 30.9 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 399.8

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 1.796

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 48.7 %

arks:

Mean η = 48.6 %

Test of

TIME	Amount of Water Used (gallons)
10·17	#
·19	8
·21	
·23	#
·25	
·27	
	1

Remarks:

TIME	Amount of Water Used (gallons)
10·36·30	#2
38·30	8
40·30	
42·30	#5
44·30	71
46·30	
	158

Remarks:

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Montreal, December 1903

t of Gilkes Turbine

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
17	#2			36·0	40	0
19	846·5			36	40	
21				36	40	
23	#5			36	40	
25	719·5			36	40	
27				—	40	4015
	1866					

Test No. 48

Average Pressure } 40 lbs./□"

Equivalent Head; Corrected } 93·55 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 4·445

Average effective brake pull (T_1-T_2) } 36 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 401·5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 2·1

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 47·2 %

narks:

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
36·30	#2			36	40	0
38·30	870			36	40	
40·30				36	40	
2·30	#5			36	40	
4·30	713·8			36	40	
6·30				—	40	4040
	1583·8					

Test No. 49

Average Pressure } 40 lbs./□"

Equivalent Head; Corrected } 93·55 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 4·49

Average effective brake pull (T_1-T_2) } 36 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 404

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 2·113

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 47 %

narks:

Mean η = 47·1 %

Test of

TIME
10·55·30
57·30
59·30
11·01·30
·03·30
·05·30

Remarks:

TIME
11·15
·17
·19
·21
·23
·25

emarks:

McGILL UNIVERSITY.

HYDRAULIC LABORATORY.

Montreal, December 1903

of Gilkes Turbine

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
	Tank					
5·30	#2			42	45	0
7·30	879			42	45	
?·30	Tank			42	45	
1·30	#5			42	45	
3·30	780·4			42	45	
5·30				—	45	397·5
	1659·4					

arks:

Test No. 50

Average Pressure } 45 lbs./□"

Equivalent Head; Corrected } 105 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 5·275

Average effective brake pull (T_1-T_2) } 42 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 397·5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 2·425

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 46·1 %

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
·15	Tank No 2.			42	45	0
17	892			42	45	
19				42	45	
21	Tank No 5			42	45	
23	752			42	45	
25				—	45	3990
	1644					

arks:

Test No. 51

Average Pressure } 45 lbs./□"

Equivalent Head; Corrected } 105 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 5·24

Average effective brake pull (T_1-T_2) } 42 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 399

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 2·435

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 46·5 %

Mean η = 46·3%

Test of

TIME
11.38
.40
.42
.44
.46
.48

Remarks:

TIME
12.04.30
06.30
08.30
10.30
12.30
14.30

Remarks:

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Montreal, December 1903

of Gilkes Turbine

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter No. of Rev'ns
8	Jauk 2.			48	50	0
40	913.8			48	50	
42				47.5	50	
44	Jauk 5			47.5	50	
46	836.8			47.5	50	
48					50	3980
	1750.6					

Test No. 52

Average Pressure } 50 lbs./□"

Equivalent Head; Corrected } 116.5 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 6.18

Average effective brake pull (T_1-T_2) } 47.7 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 398

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 2.76

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 44.7 %

arks:

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter No. of Rev'ns
4.30	Jauk #2			48	50	0
6.30	912.7			48	50	
8.30				48	50	
.30	Jauk #5			48	50	
.30	843.5			48	50	
.30				-	50	3960
	1756.2					

Test No. 53

Average Pressure } 50 lbs./□"

Equivalent Head; Corrected } 116.5 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 6.2

Average effective brake pull (T_1-T_2) } 48 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 396

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 2.76

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 44.5 %

arks:

Mean η = 44.6%

Test of

TIME
12.26
.28
.30
.32
.34
.36

Remarks:

TIME
10.09.30
11.30
13.30
15.30
17.30
19.30

Remarks:

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Montreal, December 1903

of Gilkes Turbine

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter No. of Rev'ns
26	Tank #2			58	60	0
28	987.4			58.5	60	
30				58.5	60	
32	Tank #5			58.5	60	
34	919.6			58.5	60	
36				-	60	3985
	1907					

Test No. 54

Average Pressure } 60 lbs./□"

Equivalent Head; Corrected } 139.75 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 8.06

Average effective brake pull (T_1-T_2) } 58.4 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 398.5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 3.385

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 42.0 %

arks:

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter No. of Rev'ns
9.30	Tank #2			69	70	0
.30	1070			68.5	70	
3.30				69	70	
5.30	Tank #5			68.5	70	
7.30	1005			69	70	
3.30				-	70	4000

Test No. 55

Average Pressure } 70 lbs./□"

Equivalent Head; Corrected } 161.75 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 10.14

Average effective brake pull (T_1-T_2) } 68.8 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 400

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 4.0

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 39.4 %

arks:

Test of

TIME
10·37
.39
.41
.43
.45
4

Remarks:

TIME
10·55
.57
.59
11·01
·03

emarks:

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IE	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
37	Tank #2			81	80	0
39	900			81	80	
41				80.5	80	
43	Tank #5			80.0	80	
45	870			—	80	3202
*						
	1770					

arks:

Test No. 56

Average Pressure } 80 lbs./□″

Equivalent Head; Corrected } 184.25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 12.38

Average effective brake pull (T_1-T_2) } 80.6 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 400.05

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 4.68

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 37.8 %

IE	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
55	Tank #2			92.5	90	0
57	967.5			92.0	90	
59				92.0	90	
01	Tank #5			93.0	90	
03	957.5			—	90	3195
	1925					

arks:

Test No. 57

Average Pressure } 90 lbs./□″

Equivalent Head; Corrected } 208.25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 15.22

Average effective brake pull (T_1-T_2) } 92.4 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 399.4

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 5.34

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 35.1 %

Test of

TIME

11.13

.15

.17

.19

.21

Remarks:

TIME

Remarks

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Montreal, December 1903

of

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter No. of Rev'ns
13	Jauk # 2			106	100	0
15	1027			105	100	
17				105	100	
19	Jauk # 5			105	100	
21	976			-	100	3210
	2003					

Test No. 58

Average Pressure } 100 lbs./□″

Equivalent Head; Corrected } 231.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 17.62

Average effective brake pull (T_1-T_2) } 105.25 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 401.25

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 6.13

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 34.8 %

arks:

End of Set No. II.

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter No. of Rev'ns

Test No.

Average Pressure } lbs./□″

Equivalent Head; Corrected } ft.

Total time secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

=

Average effective brake pull (T_1-T_2) } lbs.

Effective diam'r of brake wheel } ft.

Average R. P. M.

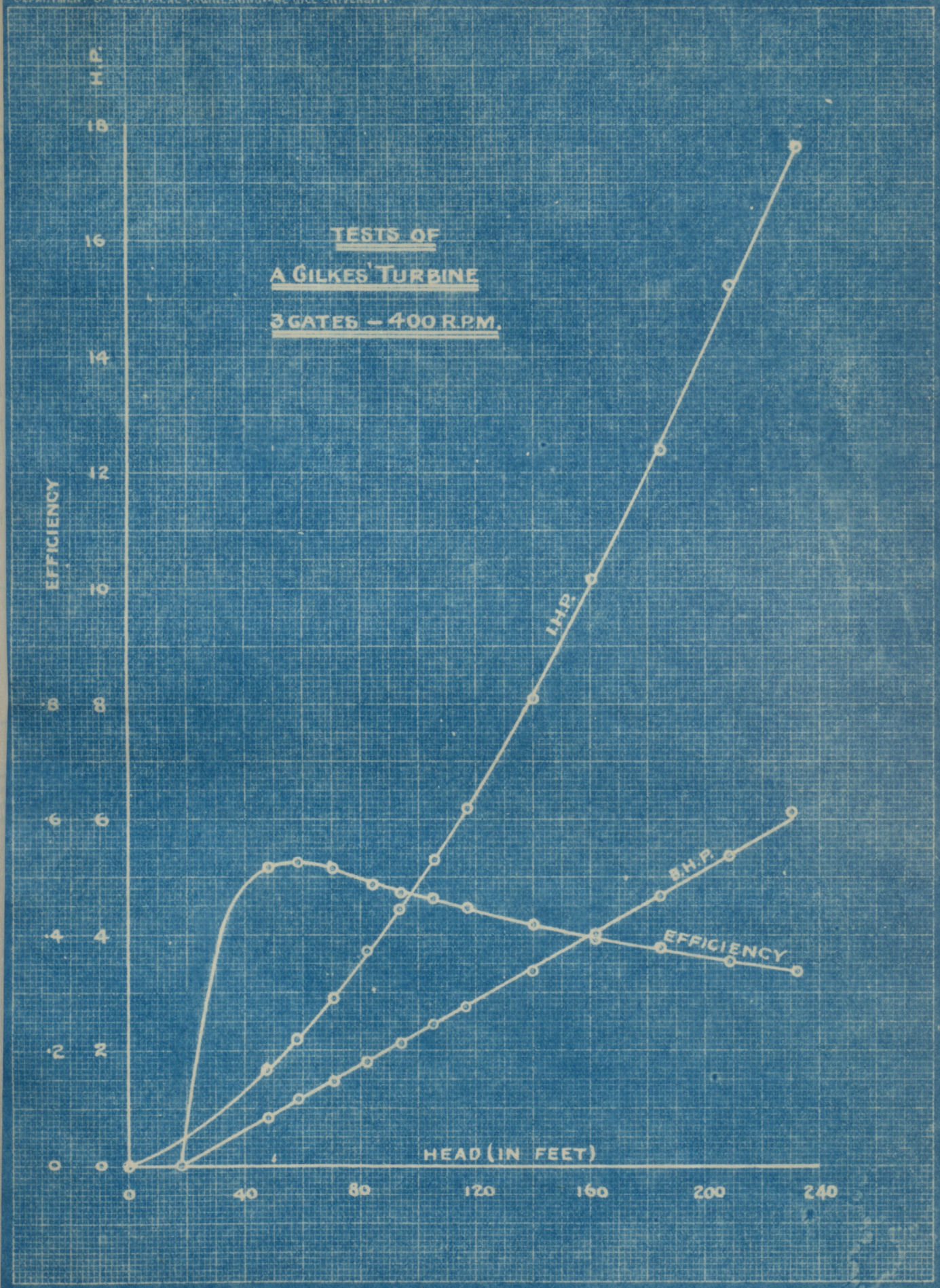
B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

=

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = %

arks:

THIS MARGIN RESERVED FOR BINDING.
IF SHEET IS READ THIS WAY (HORIZONTALLY), THIS MUST BE TOP.
IF SHEET IS READ THE OTHER WAY (VERTICALLY), THIS MUST BE LEFT-HAND SIDE.


TESTS OF
A GILKES' TURBINE
3 GATES — 400 R.P.M.
H.P.
EFFICIENCY
I.H.P.
B.H.P.
EFFICIENCY
HEAD (IN FEET)
0
2
4
6
8
10
12
14
16
18
0
40
80
120
160
200
240

Test of

TIME
11.11
.13
.15
.17
.19

Remarks:

TIME
11.27.30
.29.30
31.30
.33.30
.35.30

emarks

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Montreal, January 5th 1904

of Gilkes Turbine

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
1	Jack #2			12.0	20	0
3	577			12.0	20	
5				11.5	20	
7	Jack #5			11.5	20	
9	340			—	20	4003
	917					

Test No. 77

Average Pressure } 20 lbs./□″

Equivalent Head; Corrected } 47.6 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 1.66

Average effective brake pull (T_1-T_2) } 11.75 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 500

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .855

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 51.5 %

arks:

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
.30	Jack #2			21.0	30	0
.30	636.8			21.5	30	
.30				21.5	30	
.30	Jack #5			21.5	30	
.30	457.5			—	30	4030
	1094.3					

Test No. 78

Average Pressure } 30 lbs./□″

Equivalent Head; Corrected } 70.5 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 2.92

Average effective brake pull (T_1-T_2) } 21.4 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 504

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 1.574

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 53.9 %

arks:

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Montreal, ... Test of .....

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs. \ □")	Counter — No. of Rev'ns

Remarks:

Test No. .....

Average Pressure } ..... lbs. \ □"

Equivalent Head ; Corrected } ..... ft.

Total time ..... secs.

$$\text{I. H. P.} = \frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$$

$$= \text{.....}$$

Average effective brake pull (T_1-T_2) } ..... lbs.

Effective diam'r of brake wheel } ..... ft.

Average R. P. M. .....

$$\text{B.H.P.} = \frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$$

$$= \text{.....}$$

$$\text{Efficiency} = \frac{\text{B.H.P.}}{\text{I.H.P.}} = \text{.....} \%$$

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs. \ □")	Counter — No. of Rev'ns

Remarks

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Montreal, Jan. 5th 1904

of Gilkes Turbine

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
2.30	Jauk #2			31.5	40	0
4.30	694			31.5	40	
.30				32.5	40	
.30	Jauk #5			32.0	40	
.30	5744			—	40	4025
	1238					

rks:

Test No. 79

Average Pressure } 40 lbs./□″

Equivalent Head; Corrected } 93.55 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 4.39

Average effective brake pull (T_1-T_2) } 31.9 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 503

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 2.33

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 53.1 %

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
.30	Jauk #2			42.5	50	0
.30	747.2			42.5	50	
30				43.0	50	
.30	Jauk #5			42.5	50	
3.30	647.2			—	50	4030

arks:

Test No. 80

Average Pressure } 50 lbs./□″

Equivalent Head; Corrected } 116.5 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 6.16

Average effective brake pull (T_1-T_2) } 42.6 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 504

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 3.12

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 50.7 %

Test of

TIME
3.14.30
.16.30
.18.30
.20.30
.22.30

Remarks:

TIME
3.31.30
.33.30
.35.30
.37.30
.39.30

emarks

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Montreal, January 5th 1904.

of Gilkes Turbine

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
.30	Sauk #2			53	60	0
30	796.7			53.5	60	
30				53	60	
30	Sauk #5			53	60	
.30	728.5			–	60	4015
	1525.2					

Test No. 81

Average Pressure } 60 lbs./□″

Equivalent Head; Corrected } 139.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 8.07

Average effective brake pull (T_1-T_2) } 53.12 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 502

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 3.88

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 48.1 %

rks:

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
.30	Sauk #2			65	70	0
.30	849			65	70	
.30				65	70	
.30	Sauk #5			65	70	
.30	811.5			–	70	4030
	1660.5					

Test No. 82

Average Pressure } 70 lbs./□″

Equivalent Head; Corrected } 161.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 10.18

Average effective brake pull (T_1-T_2) } 65 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 504

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 4.76

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 46.8 %

arks:

Test of

TIME
3·49
·51
·53
·55
·57

Remarks:

TIME
4·07
·09
·11
·13
·15

Remarks:

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of Gilkes Turbine

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
9	Sauk #2			76	80	0
1	900			76	80	
3				76	80	
5	Sauk #5			76	80	
7	858.6			—	80	4002
	1758.6					

rks:

Test No. 83

Average Pressure } 80 lbs./□″

Equivalent Head; Corrected } 184.25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 12.28

Average effective brake pull (T_1-T_2) } 76 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 500

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 5.53

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 45.0 %

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
7	Sauk #2			87	90	0
9	980.7			87	90	
1				87	90	
3	Sauk #5			87	90	
5	895.3			—	90	4015
	1875					

rks:

Test No. 84

Average Pressure } 90 lbs./□″

Equivalent Head; Corrected } 208.25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 14.88

Average effective brake pull (T_1-T_2) } 87 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 502

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 6.35

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 42.7 %

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Montreal, ... 19.....

Test of

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	$T_1 - T_2$	Pressure by Gauge (lbs. □")	Counter — No. of Revns.
4.28				76	80	0
.30				76	80	
.32				76	80	
.34				76	80	
.36					80	4002

Remarks:

Test No. 86

Average Pressure } ..... 80 ..... lbs. □"

Equivalent Head; Corrected } ..... 184 · 56 ..... ft.

Total time ..... 4320 ..... secs.

$$L.H.P. = \frac{\text{Head} \times \text{pounds water used.}}{\text{Time in secs.} \times 550.}$$

$$= \text{..... } 12 \cdot 45$$

Average effective brake pull $(T_1 - T_2)$ } ..... 76 ..... lbs.

Effective diam'r of brake wheel } ..... 1·532 ..... ft.

Average R.P.M. 5900

$$B.H.P. = \frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times R.P.M.}{33000}$$

$$= \text{..... } 5 \cdot 63$$

$$\text{Efficiency} = \frac{B.H.P.}{I.H.P.} = \text{..... } 45 \cdot 0 \text{ \%}$$

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	$T_1 - T_2$	Pressure by Gauge (lbs. □")	Counter — No. of Revns.
				87	70	0
				87	70	
				87	70	
				87	70	
					70	4015

Remarks:

Test No. X41

Average Pressure } ..... 70 ..... lbs. □"

Equivalent Head; Corrected } ..... 208 · 36 ..... ft.

Total time ..... 4320 ..... secs.

$$L.H.P. = \frac{\text{Head} \times \text{pounds water used.}}{\text{Time in secs.} \times 550.}$$

$$= \text{..... } 14 \cdot 58$$

Average effective brake pull $(T_1 - T_2)$ } ..... 87 ..... lbs.

Effective diam'r of brake wheel } ..... 1·532 ..... ft.

Average R.P.M. 5900

$$B.H.P. = \frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times R.P.M.}{33000}$$

$$= \text{..... } 6 \cdot 35$$

$$\text{Efficiency} = \frac{B.H.P.}{I.H.P.} = \text{..... } 43 \cdot 7 \text{ \%}$$

Remarks:

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Montreal, January 5th 1904

of Gilkes Turbine

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
8	Sauk #2			98	100	0
0	994.5			98	100	
2				98	100	
4	Sauk #5			97.5	100	
6	978.2			—	100	4020
	1972.7					

Test No. 85

Average Pressure } 100 lbs./□″

Equivalent Head; Corrected } 231.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 17.52

Average effective brake pull (T_1-T_2) } 97.9 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 502.5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 7.14

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 40.7 %

rks:

End of Set No. V.

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns

Test No.

Average Pressure } lbs./□″

Equivalent Head; Corrected } ft.

Total time secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

=

Average effective brake pull (T_1-T_2) } lbs.

Effective diam'r of brake wheel } ft.

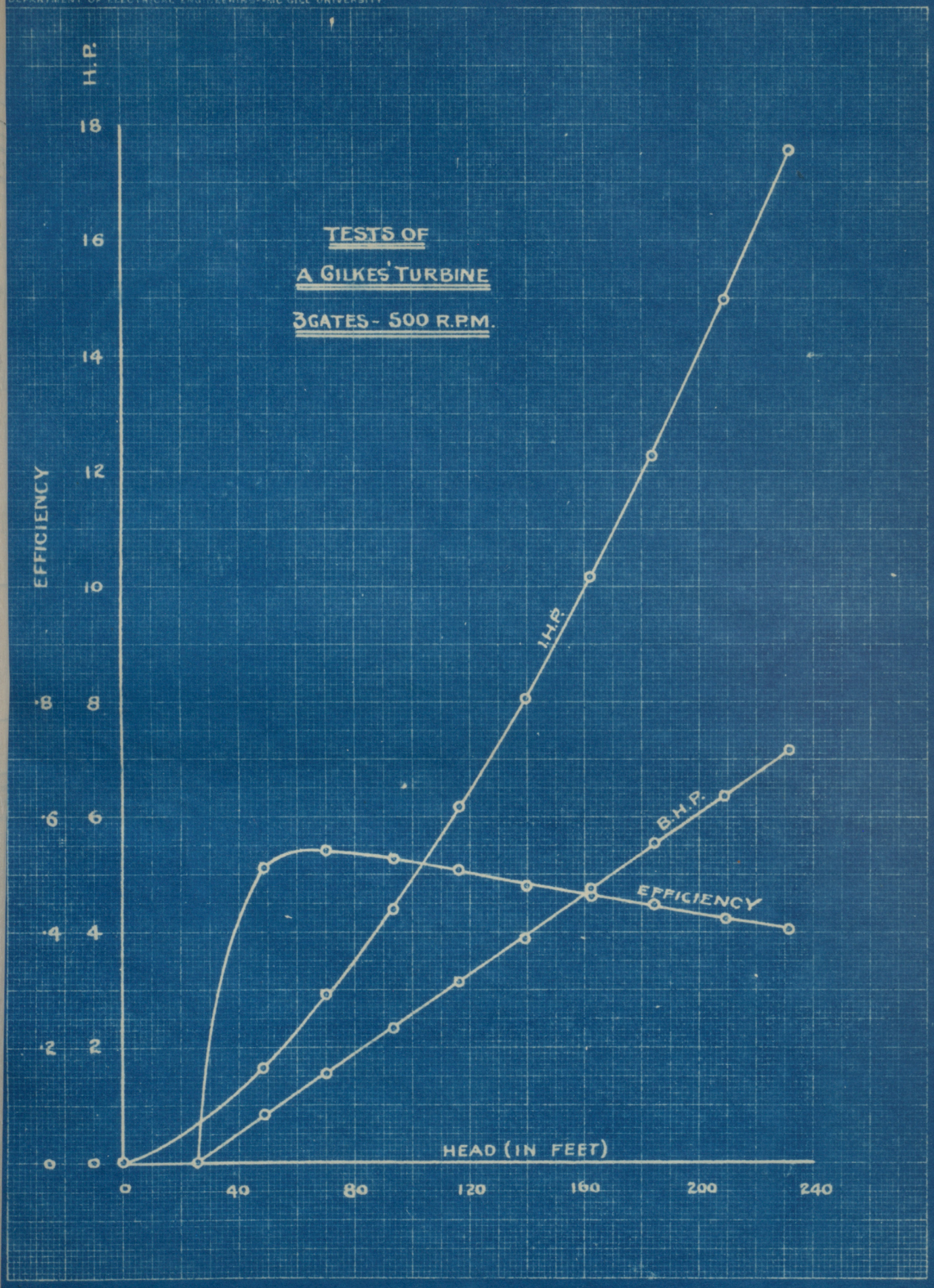
Average R. P. M.

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

=

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = %

arks:


TESTS OF
A GILKES' TURBINE
3 GATES - 500 R.P.M.
H.P.
EFFICIENCY
I.H.P.
B.H.P.
EFFICIENCY
HEAD (IN FEET)
18
16
14
12
10
8
6
4
2
0
·8
·6
·4
·2
0
40
80
120
160
200
240

Test of.....

TIME	
9.56	
.58	
10.00	
.02	
.04	

Remarks:

TIME	
10.16	
.18	
.20	
.22	
.24	

Remarks:

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Montreal, December 1903

of Gilkes Turbine.

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
6	Tank #2			9.5	20	0
8	578			9.5	20	
0				9.5	20	
2	Tank #5			10.0	20	
4	382			—	20	4795
	960					

rks:

Test No. 59

Average Pressure } 20 lbs./□″

Equivalent Head; Corrected } 47.6 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 1.73

Average effective brake pull (T_1-T_2) } 9.62 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 599.4

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .838

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 48.3 %

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
6	Tank #2			18.25	30	0
8	632.2			18.50	30	
0				18.00	30	
.2	Tank #5			18.00	30	
4	480.6			—	30	4925
	1112.8					

rks:

Test No. 60

Average Pressure } 30 lbs./□″

Equivalent Head; Corrected } 70.5 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 2.97

Average effective brake pull (T_1-T_2) } 18.2 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 616

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 1.63

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 54.9 %

Test of

TIME
10·33·30
.35·30
.37·30
.39·30
.41·30

Remarks:

TIME
10·54
.56
.58
11·00
·02

Remarks:

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Montreal, December 1903

of Gilkes Turbine

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
.30	Tank #2			28.7	40	0
30	686.2			28.7	40	
.30				28.5	40	
.30	Tank #5			29.0	40	
.30	571.4			—	40	4820
	1257.6					

Test No. 61

Average Pressure } 40 lbs./□″

Equivalent Head; Corrected } 93.55 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 4.46

Average effective brake pull (T_1-T_2) } 28.72 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 602.5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 2.508

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 56.2 %

rks:

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
54	Tank #2			39	50	0
56	746			38.5	50	
58				38.5	50	
00	Tank #5			38.5	50	
02	662			—	50	4785
	1408					

Test No. 62

Average Pressure } 50 lbs./□″

Equivalent Head; Corrected } 116.5 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 6.21

Average effective brake pull (T_1-T_2) } 38.62 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 598

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 3.36

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 54.1 %

arks:

Test of

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	$T_1 - T_2$	Pressure by Gauge (lbs. / □")	Counter No. of Revns
11.10				28·7	40	0
·12				28·7	40	
·14				28·7	40	
·16				28·7	40	
·18					40	

Remarks:

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	$T_1 - T_2$	Pressure by Gauge (lbs. / □")	Counter No. of Revns
11.27				29	60	0
·29				29	60	
·31				29	60	
·33				29	60	
·35					60	

Remarks:

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Montreal, December 1903

of Gilkes Turbine

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
)	Tank # 2			48.5	60	0
2	787.7			48.5	60	
2				48.5	60	
	Tank # 5			48.5	60	
7	784.5			—	60	4775
	1516.2					

rks:

Test No. 63

Average Pressure } 60 lbs./□″

Equivalent Head; Corrected } 139.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 8.01

Average effective brake pull (T_1-T_2) } 48.5 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 597

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 4.2

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 52.4 %

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
7	Tank # 2			59.5	70	0
9	856			59.5	70	
1				59.0	70	
3	Tank # 5			60.0	70	
5	800			—	70	4765
	1656					

rks:

Test No. 64

Average Pressure } 70 lbs./□″

Equivalent Head; Corrected } 161.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 10.14

Average effective brake pull (T_1-T_2) } 59.5 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 596

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 5.09

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 50.2 %

Test of

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	$T_1 - T_2$	Pressure by Gauge (lbs. / □")	Counter No. of Revns
43.30						
45.30						
47.30						
49.30						
57.30						

Remarks:

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	$T_1 - T_2$	Pressure by Gauge (lbs. / □")	Counter No. of Revns
12.03						
.05						
.07						
.09						
.11						

Remarks:

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Montreal, December 1903

of Gilkes Turbine

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
30	Tank #2			69	80	0
30	900			69.5	80	
30				69.5	80	
30	Tank #5			70.0	80	
30	852			—	80	4760
	1752					

rks:

Test No. 65

Average Pressure } 80 lbs./□″

Equivalent Head; Corrected } 184.25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 12.23

Average effective brake pull (T_1-T_2) } 69.5 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 595

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 6.01

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 49.0 %

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
3	Tank #2			80.	90	0
5	963			80.5	90	
7				80	90	
9	Tank #5			80	90	
1	923.3			—	90	4770
	1886.3					

rks:

Test No. 66

Average Pressure } 90 lbs./□″

Equivalent Head; Corrected } 208.25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 14.92

Average effective brake pull (T_1-T_2) } 80.1 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 596

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 6.93

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 46.5 %

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Montreal, ... 1909

Test of .....

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	$T_1 - T_2$	Pressure by Gauge (lbs. / □")	Counter No. of Revns
10.21.30				69	80	0
23.30				69.4	82	
25.30				69.2	82	
27.30				70.0	82	
29.30				—	80	4-7 1/2

Remarks:

Test No. .....

Average Pressure) ..... lbs. / □"

Equivalent Head; Corrected) ..... ft.

Total time ..... secs.

I. H. P. = $\frac{\text{Head} \times \text{pounds water used.}}{\text{Time in secs.} \times 550.}$

= .....

Average effective brake pull ($T_1 - T_2$)) ..... lbs.

Effective diam'r of brake wheel) ..... ft.

Average R. P. M. .....

B. H. P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R. P. M.}}{33000}$

= .....

Efficiency = $\frac{\text{B. H. P.}}{\text{I. H. P.}}$ = ...

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	$T_1 - T_2$	Pressure by Gauge (lbs. / □")	Counter No. of Revns

Remarks:

Test No. .....

Average Pressure) ..... lbs. / □"

Equivalent Head; Corrected) ..... ft.

Total time ..... secs.

I. H. P. = $\frac{\text{Head} \times \text{pounds water used.}}{\text{Time in secs.} \times 550.}$

= .....

Average effective brake pull ($T_1 - T_2$)) ..... lbs.

Effective diam'r of brake wheel) ..... ft.

Average R. P. M. .....

B. H. P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R. P. M.}}{33000}$

= .....

Efficiency = $\frac{\text{B. H. P.}}{\text{I. H. P.}}$ = ...

Remarks:

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Montreal, December 1903

of Gilkes Turbine.

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
30	Tank #2			93.5	100	0
30	1016			93	100	
30				93.5	100	
30	Tank #5			93.0	100	
30	967			-	100	4775
	1983					

Test No. 67

Average Pressure } 100 lbs./□″

Equivalent Head; Corrected } 231.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 17.46

Average effective brake pull (T_1-T_2) } 93.25 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 597

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 8.07

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 46.3 %

rks:

End of Set No. III.

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns

Test No.

Average Pressure } lbs./□″

Equivalent Head; Corrected } ft.

Total time secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

=

Average effective brake pull (T_1-T_2) } lbs.

Effective diam'r of brake wheel } ft.

Average R. P. M.

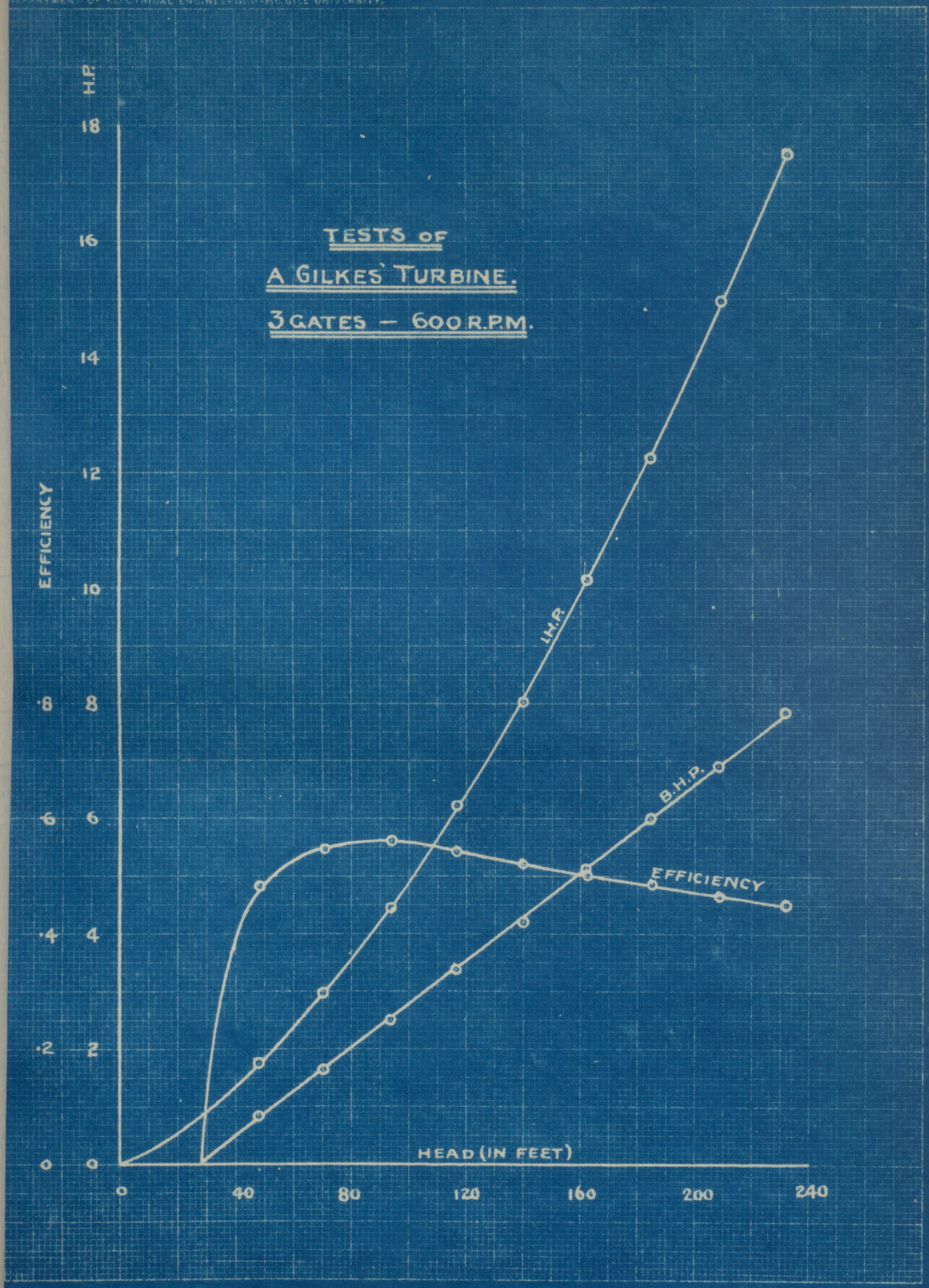
B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

=

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = %

rks:

THIS MARGIN RESERVED FOR BINDING.


TESTS OF
A GILKES' TURBINE.
3 GATES — 600 R.P.M.
H.P.
EFFICIENCY
I.H.P.
B.H.P.
EFFICIENCY
HEAD (IN FEET)
0
2
4
6
8
10
12
14
16
18
·2
·4
·6
·8
0
40
80
120
160
200
240

Test of

TIME
9·29
·31
·33
·35
·37

Remarks:

TIME
10·14
·16
·18
·20
·22

Remarks:

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Montreal, January 6th 1904.

of Gilkes Turbine

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
9	Tank #2			6.5	20	0
1	580.5			7.0	20	
3				6.5	20	
5	Tank #5			6.0	20	
7	347			–	20	5610
	927.5					

rks: Brake repaired after this test.

Test No. 86

Average Pressure } 20 lbs./□″

Equivalent Head; Corrected } 47.6 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 1.672

Average effective brake pull (T_1-T_2) } 6.5 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 701

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .673

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 40.3 %

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
4	Tank #2			15	30	0
6	633.5			15	30	
8				15	30	
0	Tank #5			15	30	
2	449			–	30	5590
	1082					

rks:

Test No. 87

Average Pressure } 30 lbs./□″

Equivalent Head; Corrected } 70.5 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 2.89

Average effective brake pull (T_1-T_2) } 15 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 699

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 1.526

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 52.8 %

Test of

TIME	
0.38	
.40	
.42	
.44	
.46	

Remarks:

TIME	
0.50	
.52	
.54	
.56	
.58	

Remarks:

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Montreal, January 6th 1904

of Gilkes Turbine.

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
8	Tank #2			25	40	0
0	700			25	40	
2				24.6	40	
4	Tank #5			25	40	
6	579			—	40	5580
	1279					

rks:

Test No. 88

Average Pressure } 40 lbs./□″

Equivalent Head; Corrected } 93.55 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 4.53

Average effective brake pull (T_1-T_2) } 24.9 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 697.5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 2.53

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 55.8 %

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
0	Tank #2			34	50	0
2	752			34.5	50	
4				34.7	50	
6	Tank #5			34.0	50	
8	655			—	50	5605
	1407					

rks:

Test No. 89

Average Pressure } 50 lbs./□″

Equivalent Head; Corrected } 116.5 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 6.2

Average effective brake pull (T_1-T_2) } 34.3 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 700.6

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 3.49

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 56.3 %

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Montreal, January 6th 1904

F .....

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
0	Tank #2			43	60	0
0	808.5			42.5	60	
0				43	60	
0	Tank #5			43	60	
0	721.9			—	60	5590

ks:

Test No. 90

Average Pressure } 60 lbs./□″

Equivalent Head; Corrected } 139.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 8.1

Average effective brake pull (T_1-T_2) } 42.9 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 699

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 4.365

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 53.8 %

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
30	Tank #2			53	70	0
30	854.7			53.5	70	
30				53.5	70	
30	Tank #5			~~53.5~~	70	
30	813.8			~~53.5~~	70	5603
	1668.5					

ks:

Test No. 91

Average Pressure } ~~70 161.75~~ lbs./□″

Equivalent Head; Corrected } 161.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 10.2

Average effective brake pull (T_1-T_2) } 53.4 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 700.4

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 5.44

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 53.2 %

McGILL UNIVERSITY.

HYDRAULIC LABORATORY.

Montreal, January 6th 1904

of Gilkes Turbine.

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
.30	Jauk #2			63.5	80	0
.30	900			64.5	80	
.30				63.5	80	
.30	Jauk #5			64.5	80	
30	860			—	80	5620
	1760					

Test No. 92

Average Pressure } 80 lbs./□″

Equivalent Head; Corrected } 184.25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 12.29

Average effective brake pull (T_1-T_2) } 64 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 702.5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 6.53

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 53.0 %

rks:

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
8	Jauk #2			74	90	0
20	965.5			75	90	
12				74.5	90	
04	Jauk #5			75	90	
16	929.8			—	90	5605
	1895.3					

Test No. 93

Average Pressure } 90 lbs./□″

Equivalent Head; Corrected } 208.25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 15.07

Average effective brake pull (T_1-T_2) } 74.6 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 700.7

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 7.55

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 50.1 %

rks:

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HYDRAULIC LABORATORY.

Montreal, January 6th 1904

of Gilkes Turbine

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
.0	Tank #2			84	100	0
2	1022			84	99.5	
4				84	100.5	
6	Tank #5			84	100	
8	971			—	100	5590
	1993					

Test No. 94

Average Pressure } 100 lbs./□″

Equivalent Head; Corrected } 231.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 17.5

Average effective brake pull (T_1-T_2) } 84 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 699

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 8.53

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 48.7 %

rks:

End of Set No. VI.

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns

Test No.

Average Pressure } lbs./□″

Equivalent Head; Corrected } ft.

Total time secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

=

Average effective brake pull (T_1-T_2) } lbs.

Effective diam'r of brake wheel } ft.

Average R. P. M.

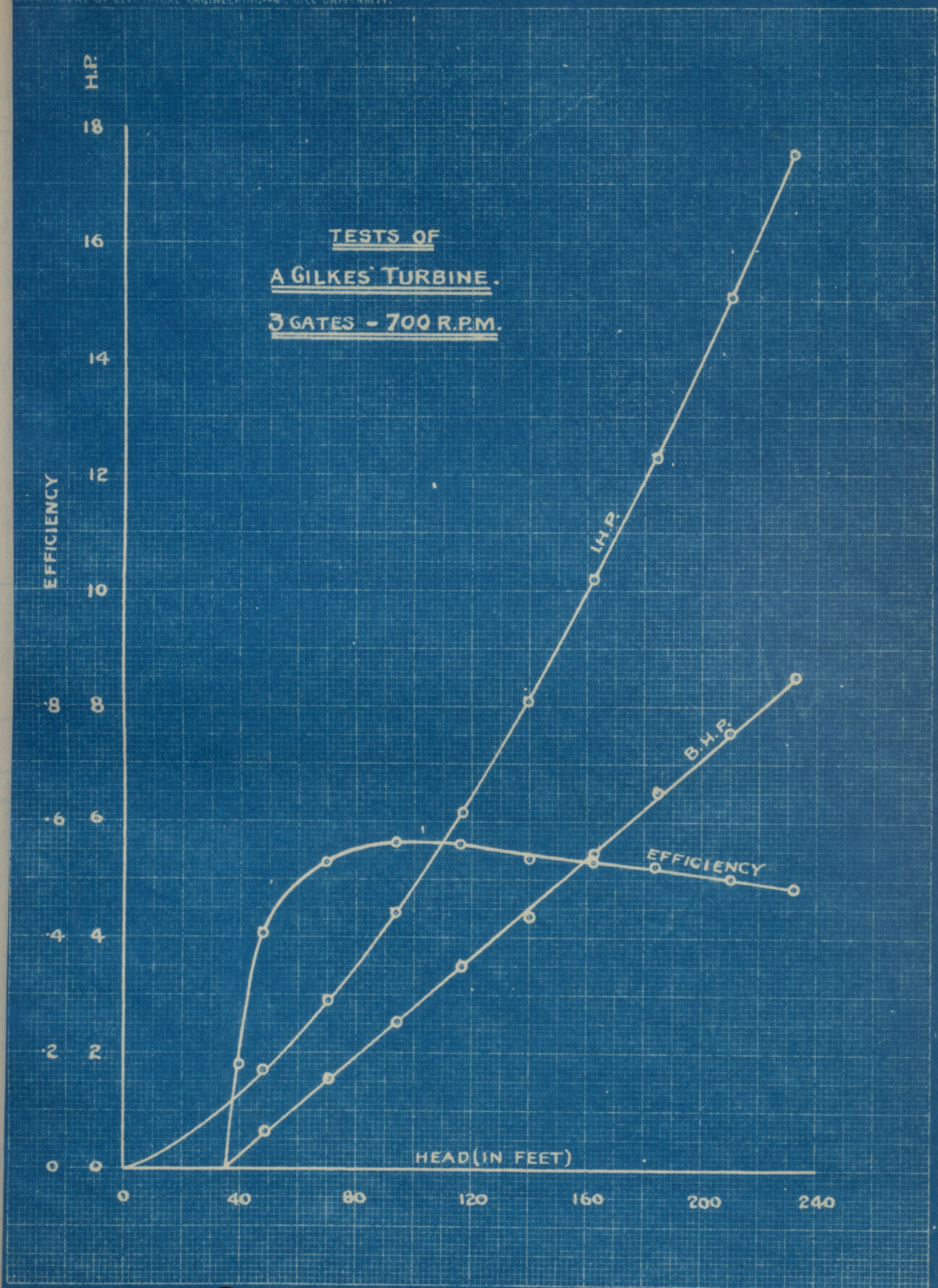
B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

=

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = %

rks:

THIS MARGIN RESERVED FOR BINDING.
IF SHEET IS READ THE WAY (HORIZONTALLY), THIS MUST BE LEFT-HAND SIDE.
IF SHEET IS READ THE OTHER WAY (VERTICALLY) THIS MUST BE LEFT-HAND SIDE.


TESTS OF
A GILKES' TURBINE.
3 GATES - 700 R.P.M.
H.P.
EFFICIENCY
I.H.P.
B.H.P.
EFFICIENCY
HEAD (IN FEET)
0
2
4
6
8
10
12
14
16
18
0
40
80
120
160
200
240

McGILL UNIVERSITY.

HYDRAULIC LABORATORY.

Montreal, December 1903.

of Gilkes' Turbine.

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
·30	Tank #2			4.5	20	0
·30	715.5			4.5	20	
·30				4.5	20	
·30	Tank #5			4.5	20	
·30	440.7			4.5	20	
30	=			4.5	20	7780
	1156.2					

ks:

Test No. 1

Average Pressure } 20 lbs./□"

Equivalent Head; Corrected } 47.6 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 47.6 × 1156.2 ÷ 33000 = 1.67

Average effective brake pull (T_1-T_2) } 4.5 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 778

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .508

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 30.4 %

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
5	#2			4.5	20	0
7	716.1			4.3	20	
9				4.3	20	
21	#5			4.5	20	
23	439			4.4	20	
25				-	20	7785
	1155.1					

arks:

Test No. 2.

Average Pressure } 20 lbs./□"

Equivalent Head; Corrected } 47.6 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 1.669

Average effective brake pull (T_1-T_2) } 4.4 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 778.5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .498

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 29.9 %

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Montreal, December 1903

of Gilkes' Turbine.

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
:1	#2			4.5	20	0
.3	751.5			4.5	20	
.5				4.5	20	
.7	#5			4.5	20	
29	439			4.5	20	
31				-	20	7805
	1190.5					

Test No. 3

Average Pressure } 20 lbs./□"

Equivalent Head; Corrected } 47.6 ft.

Total time 600 secs.

I. H. P. = Head x pounds water used. / Time in secs. x 550.

= 1.72

Average effective brake pull (T_1-T_2) } 4.5 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 780.5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .511

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 29.7 %

rks:

Mean η of 3 tests = 30.0

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
22	#2			8.25	25	0
24	750.5			8.25	25	
26				8.25	25	
28	#5			8.25	25	
30	532.2			8.25	25	
32				-	25	7850
	1282.7					

Test No. 4

Average Pressure } 25 lbs./□"

Equivalent Head; Corrected } 58.35 ft.

Total time 600 secs.

I. H. P. = Head x pounds water used. / Time in secs. x 550.

= 2.268

Average effective brake pull (T_1-T_2) } 8.25 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 785

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .941

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 41.5 %

arks:

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Montreal, December 1903

of Gilkes Turbine

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
3·30	#2			8·25	25	0
·30	743·7			8·25	25	
30				8·25	25	
30	#5			8·25	25	
30	535·7			8·25	25	
·30				—	25	7890
	1289·4					

Test No. 5

Average Pressure } 25 lbs./□″

Equivalent Head; Corrected } 58·35 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 2·28

Average effective brake pull (T_1-T_2) } 8·25 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 789

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= ·9465

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = ×41·55 %

rks:

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
04	#2			8·25	25	0
06	745			8·25	25	
08				8·25	25	
10	#5			8·25	25	
12	538			8·25	25	
14				8·25	25	7895
	1283					

Test No. 6

Average Pressure } 25 lbs./□″

Equivalent Head; Corrected } 58·35 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 2·27

Average effective brake pull (T_1-T_2) } 8·25 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 789·5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= ·947

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = ×41·78 %

arks:

Mean η = ×41·55 %

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Montreal, December 1903

of Gilkes Turbine

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
5	#2			13	30	0
7	801			13	30	
3				13	30	
1	#5			13.5	30	
3	616.1			13.5	30	
5				—	30	7850
	1417.1					

rks:

Test No. 7

Average Pressure } 30 lbs./□″

Equivalent Head; Corrected } 70.5 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 3.028

Average effective brake pull (T_1-T_2) } 13.2 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 785

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 1.508

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 49.8 %

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
4.30	#2			13.5	30	0
.30	801			13.5	30	
.30				13.5	30	
.30	#5			13	30	
.30	613.8			13	30	
.30				—	30	7825
	1414.8					

rks:

Test No. 8

Average Pressure } 30 lbs./□″

Equivalent Head; Corrected } 70.5 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 3.015

Average effective brake pull (T_1-T_2) } 13.3 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 782.5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 1.51

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 50. %

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Montreal, December 1903

of Gilkes Turbine.

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
2.30	#2			13	30	0
·30	795			13	30	
30				13	30	
30	#5			13	30	
30	615			13	30	
30				–	30	7780
	1410					

Test No. 9

Average Pressure } 30 lbs./□″

Equivalent Head; Corrected } 70.5 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 3.015

Average effective brake pull (T_1-T_2) } 13 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 778

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 1.473

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = ·490 %

Mean η = 49.6 %

rks:

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
12.30	#2			18	35	0
4.30	734.1			18	35	
6-30				18	35	
8·30	#5			18	35	
·30	800			18	35	
·30				–	35	7770
	1534.1					

Test No. 10

Average Pressure } 35 lbs./□″

Equivalent Head; Corrected } 82 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 3.81

Average effective brake pull (T_1-T_2) } 18 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 777

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 2.035

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = ·534 %

rks:

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	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
:30	#2			18	35	0
o	772.5			18	35	
				18	35	
o	#5			18	35	
2	766.3			18	35	
4				-	35	7780
	1538.8					

rks:

Test No. 11

Average Pressure } 35 lbs./□"

Equivalent Head; Corrected } 82 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 3.82

Average effective brake pull (T_1-T_2) } 18 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 778

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 2.037

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = x 53.3 %

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
:30	#2			18	35	0
:30	709.8			18	35	
:30				18	35	
:30	#5			18	35	
:30	809.8			18	35	
:30				#-	35	7770
	1519.6					

rks:

Test No. 12

Average Pressure } 35 lbs./□"

Equivalent Head; Corrected } 82 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 3.78

Average effective brake pull (T_1-T_2) } 18 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 777

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 2.015

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = x 53.35 %

Mean η = x 53.35 %

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	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
7.30	#2			23	40	0
30	802			23	40	
.30				23	40	
.30	#5			23	40	
.30	817.3			23	40	
.30				—	40	7670
	1619.3					

rks:

Test No. 13

Average Pressure } 40 lbs./□"

Equivalent Head; Corrected } 93.55 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 4.59

Average effective brake pull (T_1-T_2) } 23 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 767

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 2.562

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 55.8 %

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
8	#2			23	40	0
0	800			23	40	
2				23	40	
34	#5			23	40	
36	819.5			23	40	
38				—	40	7670
	1619.5					

rks:

Test No. 14

Average Pressure } 40 lbs./□"

Equivalent Head; Corrected } 93.55 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 4.59

Average effective brake pull (T_1-T_2) } 23 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 767

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 2.561

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 55.8 %

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	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
·30	#2			23	40	0
·30	800			23	40	
·30				23	40	
·30	#5			23	40	
·30	819			23	40	
·30	—			—	40	7660
	1619					

Test No. 15

Average Pressure } 40 lbs./□"

Equivalent Head; Corrected } 93.55 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 4.59

Average effective brake pull (T_1-T_2) } 23 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 766

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 2.561

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = x 55.8 %

rks:

Mean η = x55·8

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
.30	#2			28	45	0
·30	826.8			28	45	
·30				28	45	
30	#5			28	45	
30	888.5			28	45	
30				—	45	7650
	1715.3					

Test No. 16

Average Pressure } 45 lbs./□"

Equivalent Head; Corrected } 105 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 5.45

Average effective brake pull (T_1-T_2) } 28 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 765

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 3.115

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = x 57.2 %

arks:

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Montreal, ... 1923

Test of .....

Test	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	$T_1 - T_2$	Pressure by Gauge (lbs. / □")	Counter No. of Rev'ns	TIME	Remarks

Test No. .....

Average Pressure } ..... lbs. / □"

Equivalent Head; Corrected } ..... ft.

Total time ..... secs.

I.H.P. = $\frac{\text{Head} \times \text{pounds water used.}}{\text{Time in secs.} \times 550.}$

= .....

Average effective brake pull $(T_1 - T_2)$ } ..... lbs.

Effective diam'r of brake wheel } ..... ft.

Average R.P.M. .....

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .....

Efficiency = $\frac{\text{B.H.P.}}{\text{I.H.P.}}$ = ... %

Test	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	$T_1 - T_2$	Pressure by Gauge (lbs. / □")	Counter No. of Rev'ns	TIME	Remarks

Test No. .....

Average Pressure } ..... lbs. / □"

Equivalent Head; Corrected } ..... ft.

Total time ..... secs.

I.H.P. = $\frac{\text{Head} \times \text{pounds water used.}}{\text{Time in secs.} \times 550.}$

= .....

Average effective brake pull $(T_1 - T_2)$ } ..... lbs.

Effective diam'r of brake wheel } ..... ft.

Average R.P.M. .....

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .....

Efficiency = $\frac{\text{B.H.P.}}{\text{I.H.P.}}$ = ... %

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E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
.30	#2			28	45	0
30	832.6			28	45	
.30				28	45	
30	#5			28	45	
.30	884			28	45	
.30				-	45	7650
	1716.6					

rks:

Test No. 17

Average Pressure } 45 lbs./□"

Equivalent Head; Corrected } 105 ft.

Total time 600 secs.

I. H. P. = Head x pounds water used. / Time in secs. x 550.

= 5.452

Average effective brake pull (T_1-T_2) } 28 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 765

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 3.115

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 57.2 %

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
.30	#2			28	45	0
.30	829.1			28	45	
.30				28	45	
.30	#5			28	45	
.30	886			28	45	
.30				-	45	7650
	1715.1					

arks:

Test No. 18

Average Pressure } 45 lbs./□"

Equivalent Head; Corrected } 105 ft.

Total time 600 secs.

I. H. P. = Head x pounds water used. / Time in secs. x 550.

= 5.45

Average effective brake pull (T_1-T_2) } 28 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 765

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 3.115

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 57.2 %

Mean η = 57.2%

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_____

Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	$T_1 - T_2$	Pressure by Gauge (lbs./□")	Counter No. of Rev'ns

Test No. _____

Average Pressure } _____ lbs./□"

Equivalent Head; Corrected } _____ ft.

Total time _____ secs.

I.H.P. = $\frac{\text{Head} \times \text{pounds water used.}}{\text{Time in secs.} \times 550.}$

= _____

Average effective brake pull ($T_1 - T_2$) _____ lbs.

Effective diam'r of brake wheel _____ ft.

Average R.P.M. _____

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= _____

Efficiency = $\frac{\text{B.H.P.}}{\text{I.H.P.}}$ = _____ %

Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	$T_1 - T_2$	Pressure by Gauge (lbs./□")	Counter No. of Rev'ns

Test No. _____

Average Pressure } _____ lbs./□"

Equivalent Head; Corrected } _____ ft.

Total time _____ secs.

I.H.P. = $\frac{\text{Head} \times \text{pounds water used.}}{\text{Time in secs.} \times 550.}$

= _____

Average effective brake pull ($T_1 - T_2$) _____ lbs.

Effective diam'r of brake wheel _____ ft.

Average R.P.M. _____

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= _____

Efficiency = $\frac{\text{B.H.P.}}{\text{I.H.P.}}$ = _____ %

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	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
-0	#2			32	~~50~~	0
2	847.7			32	50	
4				31.5	50	
6	#5			31.5	50	
8	939.1			31.5	50	
0				—	50	7780
	1786.8					

Test No. 19

Average Pressure } 50 lbs./□"

Equivalent Head; Corrected } 116.5 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 6.3

Average effective brake pull (T_1-T_2) } 31.7 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 778

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 3.58

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 56.8 %

rks:

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
.30	#2			32	50	0
.30	810.5			32	50	
.30				31.5	50	
7.30	#5			32	50	
7.30	993.2			31.5	50	
.30				—	50	7790
	1803.7					

Test No. 20

Average Pressure } 50 lbs./□"

Equivalent Head; Corrected } 116.5 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 6.36

Average effective brake pull (T_1-T_2) } 31.8 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 779

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 3.59

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 56.6 %

rks:

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Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	$T_1 - T_2$	Pressure by Gauge (lbs. / □")	Counter No. of Revs

Test No. _____

Average Pressure) _____ lbs. / □"

Equivalent Head; Corrected) _____ ft.

Total time _____ secs.

$$\text{I. H. P.} = \frac{\text{Head} \times \text{pounds water used.}}{\text{Time in secs.} \times 550.}$$

$$= _____$$

Average effective brake pull $(T_1 - T_2)$ _____ lbs.

Effective diam'r of brake wheel _____ ft.

Average R. P. M. _____

$$\text{B.H.P.} = \frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$$

$$= _____$$

$$\text{Efficiency} = \frac{\text{B.H.P.}}{\text{I.H.P.}} = _____ \%$$

Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	$T_1 - T_2$	Pressure by Gauge (lbs. / □")	Counter No. of Revs

Test No. _____

Average Pressure) _____ lbs. / □"

Equivalent Head; Corrected) _____ ft.

Total time _____ secs.

$$\text{I. H. P.} = \frac{\text{Head} \times \text{pounds water used.}}{\text{Time in secs.} \times 550.}$$

$$= _____$$

Average effective brake pull $(T_1 - T_2)$ _____ lbs.

Effective diam'r of brake wheel _____ ft.

Average R. P. M. _____

$$\text{B.H.P.} = \frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$$

$$= _____$$

$$\text{Efficiency} = \frac{\text{B.H.P.}}{\text{I.H.P.}} = _____ \%$$

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E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
3·30	#2			32·0	50	0
30	847·7			31·5	50	
30				31·5	50	
·30	#5			31·0	50	
·30	953.			31·0	50	
·30				—	50	7790
	1800·7					

Test No. 21

Average Pressure } 50 lbs./□"

Equivalent Head; Corrected } 116·5 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 6·35

Average effective brake pull (T_1-T_2) } 31·4 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 779

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 3·57

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 56·4 %

rks:

Mean η = 56·6 %

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
7	#2			36	55	0
9	884.8			36·5	55	
1				36·5	55	
3	#5			36	55	
5	995.4			35·5	55	
7					55	7785
	1880·2					

Test No. 22

Average Pressure } 55 lbs./□"

Equivalent Head; Corrected } 127·75 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 7·28

Average effective brake pull (T_1-T_2) } 36·1 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 778·5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 4·08

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 56·1 %

arks:

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	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
	#2			36	55	0
	880·3			36·5	55	
				36	55	
	#5			35	55	
	999·2			36	55	
				—	55	7790
	1879·5					

Test No. 23

Average Pressure } 55 lbs./□″

Equivalent Head; Corrected } 127·75 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 7·29

Average effective brake pull (T_1-T_2) } 35·9 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 779

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 4·07

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 55·9 %

ks:

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
2	#2			36	55	0
4	870			36	55	
6				36·5	55	
8	#5			36·5	55	
+0	1030·5			36	55	
-2				—	55	7800
	1901·5			3		

Test No. 24

Average Pressure } 55 lbs./□″

Equivalent Head; Corrected } 127·75 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 7·36

Average effective brake pull (T_1-T_2) } 36·2 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 780

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 4·11

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 55·9 %

rks:

Mean η = 56 %

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:	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
0	#2			40	60	0
2	1009			40	60	
4				40	60	
6	#5			40	60	
8	952			40	60	
0				–	60	7820
	1961					

rks:

Test No. 25

Average Pressure } 60 lbs./□″

Equivalent Head; Corrected } 139.75 ft.

Total time 600 secs.

I. H. P. = Head x pounds water used. / Time in secs. x 550.

= 8.3

Average effective brake pull (T_1-T_2) } 40 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 782

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 4.54

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 54.7 %

:	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
8	#2			40	60	0
40	911.5			40	60	
2				40	60	
4	#5			40	60	
6	1048			40	60	
8				–	60	7800
	1959.5					

rks:

Test No. 26

Average Pressure } 60 lbs./□″

Equivalent Head; Corrected } 139.75 ft.

Total time 600 secs.

I. H. P. = Head x pounds water used. / Time in secs. x 550.

= 8.28

Average effective brake pull (T_1-T_2) } 40 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 780

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 4.53

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 54.7 %

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E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
.8	#2			40	60	0
0	1020			40.5	60	
2				40.5	60	
4	#5			40.5	60	
6	940.2			40	60	
8				—	60	7805
	1960.2					

Test No. 27

Average Pressure } 60 lbs./□″

Equivalent Head; Corrected } 139.75 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 8.3

Average effective brake pull (T_1-T_2) } 40.3 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 780.5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 4.57

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 55 %

rks:

Speed Counter had to be adjusted after this test.

Mean η = 54.8 %

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
3	#2			51	70	0
5	1045			50	70	
7				50	70	
9	#5			50	70	
1	1072			50	70	
3				—	70	7830
	2117					

Test No. 28

Average Pressure } 70 lbs./□″

Equivalent Head; Corrected } 161.75 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 10.37

Average effective brake pull (T_1-T_2) } 50.2 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 783

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 5.7

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 54.9 %

rks:

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E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
47	#2			50	70	0
49	1070			50	70	
57				50·5	70	
03	#5			50	70	
05	1037			50	70	
07				–	70	7800
	2107					

rks: Speed counter had to be adjusted just after this trial.

Test No. 29

Average Pressure } 70 lbs./□″

Equivalent Head; Corrected } 161.75 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 10.31

Average effective brake pull (T_1-T_2) } 50.1 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 780

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 5.66

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 54.8 %

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
45	#2			49	70	0
07	1067			49	70	
56				49	70	
01	#5			50	70	
03	1042			50	70	
05				–	70	7880
	2109					

arks:

Test No. 30

Average Pressure } 70 lbs./□″

Equivalent Head; Corrected } 161.75 ft.

Total time 600 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 10.32

Average effective brake pull (T_1-T_2) } 49.4 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 788

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 5.66

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 54.8 %

Mean η = 54.83 %

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E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
1	#2			58	80	0
3	911.5			58	80	
5				59	80	
7	#5			59	80	
9	877			–	80	6255
11						
	1788.5					

Test No. 31

Average Pressure } 80 lbs./□″

Equivalent Head; Corrected } 184.25 ft.

Total time 480 secs.

$$\text{I. H. P.} = \frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$$

$$= 12.5$$

Average effective brake pull (T_1-T_2) } 58.5 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 782

$$\text{B.H.P.} = \frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$$

$$= 6.63$$

$$\text{Efficiency} = \frac{\text{B.H.P.}}{\text{I. H. P.}} = 53.0\ \%$$

rks:

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
1.30	#2			58	80	0
3.30	926.5			59	80	
5.30				59	80	
7.30	#5			59	80	
9.30	871.5			–	80	6290
11.30						
	1798					

Test No. 32

Average Pressure } 80 lbs./□″

Equivalent Head; Corrected } 184.25 ft.

Total time 480 secs.

$$\text{I. H. P.} = \frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$$

$$= 12.57$$

Average effective brake pull (T_1-T_2) } 58.75 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 786

$$\text{B.H.P.} = \frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$$

$$= 6.70$$

$$\text{Efficiency} = \frac{\text{B.H.P.}}{\text{I. H. P.}} = 53.2\ \%$$

arks:

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Test No. 61

Average Pressure } 80 lbs. / □"

Equivalent Head; Corrected } 184·25 ft.

Total time 480 secs.

$$\text{I. H. P.} = \frac{\text{Head} \times \text{pounds water used.}}{\text{Time in secs.} \times 550.}$$

$$= 12·52$$

Average effective brake pull (T_1-T_2) } 58·5 lbs.

Effective diam'r of brake wheel } 1·252 ft.

Average R. P. M. 78·2

$$\text{B.H.P.} = \frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$$

$$= 6·63$$

$$\text{Efficiency} = \frac{\text{B.H.P.}}{\text{I.H.P.}} = 53·0\ \%$$

Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs. / □")	Counter No. of Revns
1882	58	0	58	80	0
1882	67		67	80	
1882	64		64	80	
1882	64		64	80	
1882	–		–	80	6265

Test No. 62

Average Pressure } 80 lbs. / □"

Equivalent Head; Corrected } 184·25 ft.

Total time 480 secs.

$$\text{I. H. P.} = \frac{\text{Head} \times \text{pounds water used.}}{\text{Time in secs.} \times 550.}$$

$$= 12·52$$

Average effective brake pull (T_1-T_2) } 58·5 lbs.

Effective diam'r of brake wheel } 1·252 ft.

Average R. P. M. 78·6

$$\text{B.H.P.} = \frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$$

$$= 6·70$$

$$\text{Efficiency} = \frac{\text{B.H.P.}}{\text{I.H.P.}} = 53·5\ \%$$

Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs. / □")	Counter No. of Revns
1882	68		68	80	0
1882	67		67	80	
1882	64		64	80	
1882	64		64	80	
1882	–		–	80	6340

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	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
49	#2			59.5	80	0
01	916			59.5	80	
3	+			60	80	
5	#5			60	80	
37	873			–	80	6220
	=					
	1789					

Test No. 33

Average Pressure } 80 lbs./□″

Equivalent Head; Corrected } 184.25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 12.56

Average effective brake pull (T_1-T_2) } 59.75 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 777.5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 6.74

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 53.3 %

rks:

Mean η = 53.15%

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
30	#2			69.5	90	0
30	966.7			69.0	90	
30				70.0	90	
30	#5			69.7	90	
30	929.9			–	90	6325
	1896.6					

Test No. 34

Average Pressure } 90 lbs./□″

Equivalent Head; Corrected } 208.25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 15.0

Average effective brake pull (T_1-T_2) } 69.55 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 790.6

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 8.0

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 53.2 %

rks:

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	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
30	#2			69.5	90	0
30	963			69.5	90	
30				70.0	90	
30	#5			69.5	90	6260
30	931			—		
	1894					

Test No. 35

Average Pressure } 90 lbs./□"

Equivalent Head; Corrected } 208.25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 14.98

Average effective brake pull (T_1-T_2) } 69.6 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 783

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 7.93

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 53.0 %

rks:

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
8	#2			69.5	90	0
-0	954			70.5	90	
-2				70.5	90	
-4	#5			69.5	90	
+6	938			—	90	6260
	1892					

Test No. 36

Average Pressure } 90 lbs./□"

Equivalent Head; Corrected } 208.25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 14.96

Average effective brake pull (T_1-T_2) } 70 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 783

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 7.97

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 53.3 %

rks:

Mean η = 53.1 %

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of Gilkes Turbine

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
30	#2			79.5	100	0
30	1017			80.0	100	
30				79.5	100	
30	#5			80.0	100	
30	984			—	100	6250
	2001					

rks:

Test No. 37

Average Pressure } 100 lbs./□"

Equivalent Head; Corrected } 231.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 17.54

Average effective brake pull (T_1-T_2) } 79.75 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 781

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 9.05

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 51.6 %

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
38	#2			80	100	0
40	1016			80	100	
42				80	100	
44	#5			79.7	100	
6	989				100	6260
	2007					

rks:

Test No. 38

Average Pressure } 100 lbs./□"

Equivalent Head; Corrected } 231.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 17.60

Average effective brake pull (T_1-T_2) } 79.9 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 783

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 9.09

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 51.7 %

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TIME	BRAKE READINGS (lbs.) T_1	T_2	$T_1 - T_2$	Pressure by Gauge (lbs. / □")	Counter No. of Rev'ns	Amount of Water Used (gallons)
12·52	78·5	18·0	60·5	160	0	
·54	78·0	18·0	60·0	160		
·56	77·5	17·5	60·0	160		
·58	78·0	18·0	60·0	160		
1·00	78·0	18·0	60·0	160	6250	

Test No.

Average Pressure } lbs. □"

Equivalent Head; Corrected } ft.

Total time secs.

$$I.H.P. = \frac{\text{Head} \times \text{pounds water used.}}{\text{Time in secs.} \times 550.}$$

$$= \qquad \text{ft.}$$

Average effective brake pull $(T_1 - T_2)$ lbs.

Effective diam'r of brake wheel ft.

Average R. P. M.

$$B.H.P. = \frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$$

$$=$$

$$\text{Efficiency} = \frac{B.H.P.}{I.H.P.} =$$

TIME	BRAKE READINGS (lbs.) T_1	T_2	$T_1 - T_2$	Pressure by Gauge (lbs. / □")	Counter No. of Rev'ns	Amount of Water Used (gallons)
	80	20	60	160	0	
	80	20	60	160		
	80	20	60	160		
	79·5	19·5	60	160		
	80	20	60	160	6250	

Test No.

Average Pressure } lbs. □"

Equivalent Head; Corrected } ft.

Total time secs.

$$I.H.P. = \frac{\text{Head} \times \text{pounds water used.}}{\text{Time in secs.} \times 550.}$$

$$= \qquad \text{ft.}$$

Average effective brake pull $(T_1 - T_2)$ lbs.

Effective diam'r of brake wheel ft.

Average R. P. M.

$$B.H.P. = \frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$$

$$=$$

$$\text{Efficiency} = \frac{B.H.P.}{I.H.P.} =$$

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Montreal, December 1903

of Gilkes Turbine

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
2	#2			80·5	100	0
4	1018			80	100	
6				80·5	100	
8	#5			80·5	100	
0	990			—	100	6250
	2008					

Test No. 39

Average Pressure } 100 lbs./□"

Equivalent Head; Corrected } 231·75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 17·63

Average effective brake pull (T_1-T_2) } 80·4 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 781

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 9·1

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 51·6 %

Mean η = 51·63.

rks:

End of Set No. I.

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns

Test No.

Average Pressure } lbs./□"

Equivalent Head; Corrected } ft.

Total time secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

=

Average effective brake pull (T_1-T_2) } lbs.

Effective diam'r of brake wheel } ft.

Average R. P. M.

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

=

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = %

rks:

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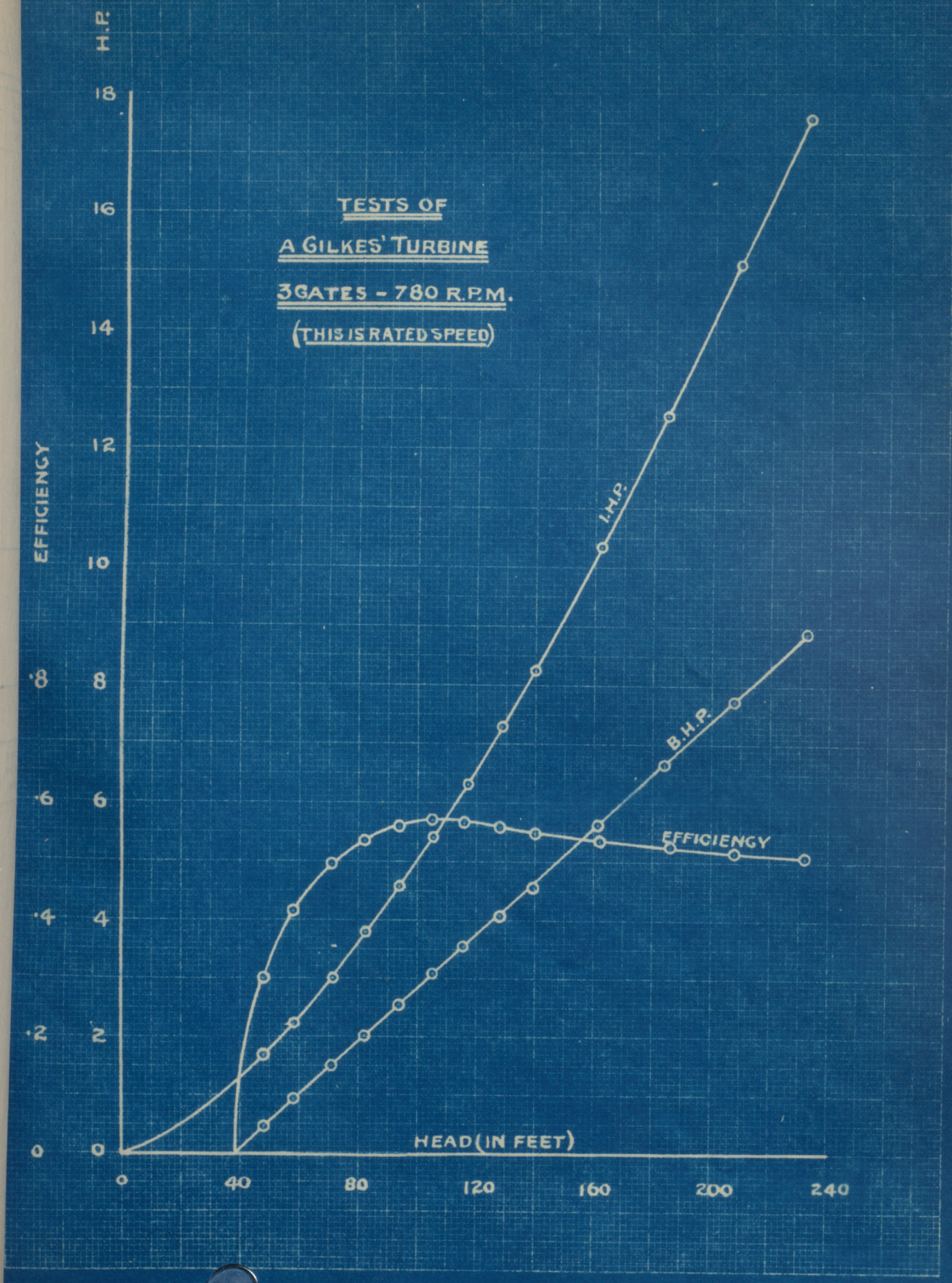

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Montreal, January 6th 1904

of Gilkes Turbine

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
1	Tank #2			1·0	20	0
5	577			1·0	20	
5				0·5	20	
1	Tank #5			1·0	20	
9	339			—	20	7135
	916					

Test No. 95

Average Pressure } 20 lbs./□″

Equivalent Head; Corrected } 47·6 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 1·658

Average effective brake pull (T_1-T_2) } ·9 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 892

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= ·116

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 7·0 %

ks:

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
	Tank #2			8·5	30	0
	635·5			9·5	30	
0				9·5	30	
2	Tank #5			9·5	30	
4	460			—	30	7140
	1095·5					

Test No. 96

Average Pressure } 30 lbs./□″

Equivalent Head; Corrected } 70·5 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 2·925

Average effective brake pull (T_1-T_2) } 9·25 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 892·5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 1·2

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 41·4 %

ks:

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	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
.30	Tank #2			17.8	40	0
30	682.7			18.2	40	
30				17.7	40	
30	Tank #5			18.5	40	
.30	580.3			—	40	7145
	1263					

Test No. 97

Average Pressure } 40 lbs./□"

Equivalent Head; Corrected } 93.55 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 4.48

Average effective brake pull (T_1-T_2) } 18.2 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 893

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 2.336

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 51.3 %

rks:

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
9	Tank #2			26.5	50	0
1	749.5			26.0	50	
3				26.5	50	
5	Tank #5			27.0	50	
7	670			—	50	7080
	1419.5					

Test No. 98

Average Pressure } 50 lbs./□"

Equivalent Head; Corrected } 116.5 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 6.27

Average effective brake pull (T_1-T_2) } 26.5 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 885

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 3.42

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 54.5 %

rks:

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	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
8	Jauk #2			35.5	60	0
)	816.3			36.0	60	
-				36.0	60	
+	Jauk #5			36.0	60	
)	756.3			—	60	7140
	1572.6					

Test No. 99

Average Pressure } 60 lbs./□″

Equivalent Head; Corrected } 139.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 8.31

Average effective brake pull (T_1-T_2) } 35.9 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 892.5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 4.66

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 56.0 %

·ks:

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
5	Jauk #2			45.0	70	0
7	876			45.5	70	
?				45.5	70	
1	Jauk #5			45.0	70	
3	818.5			—	70	7090

Test No. 100

Average Pressure } 70 lbs./□″

Equivalent Head; Corrected } 161.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 10.38

Average effective brake pull (T_1-T_2) } 45.25 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 887

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 5.83

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 56.2 %

·ks:

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of Gilkes Turbine.

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
·30	Jauk #2			54.0	80	0
30	909.2			54.5	80	
30				54.5	80	
30	Jauk #5			54.0	80	
30	884.0			—	80	7075
	1793.2					

·ks:

Test No. 101

Average Pressure } 80 lbs./□"

Equivalent Head; Corrected } 184.25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 12.54

Average effective brake pull (T_1-T_2) } 54.25 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 884

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 6.95

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 55.6 %

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
5	Jauk #2			63.0	90	0
7	976			63.5	90	
9				64.0	90	
1	Jauk #5			64.0	90	
3	933.4			—	90	7095
	1909.4					

rks:

Test No. 102

Average Pressure } 90 lbs./□"

Equivalent Head; Corrected } 208.25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 15.1

Average effective brake pull (T_1-T_2) } 63.9 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 887

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 8.22

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 54.5 %

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Montreal, January 6th 1904.

of Gilkes Turbine.

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
L	Vault # 2			74	100.5	0
)	1018			74	100	
				74	100.5	
)	Vault # 5			74.2	100.5	
2	996.5			–	100.5	7115
	2014.5					

Test No. 103

Average Pressure } 100.5 lbs./□″

Equivalent Head; Corrected } 232.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 17.72

Average effective brake pull (T_1-T_2) } 74 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 888.4

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 9.52

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 53.8 %

·ks:

End of Set No. VII.

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns

Test No.

Average Pressure } lbs./□″

Equivalent Head; Corrected } ft.

Total time secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

=

Average effective brake pull (T_1-T_2) } lbs.

Effective diam'r of brake wheel } ft.

Average R. P. M.

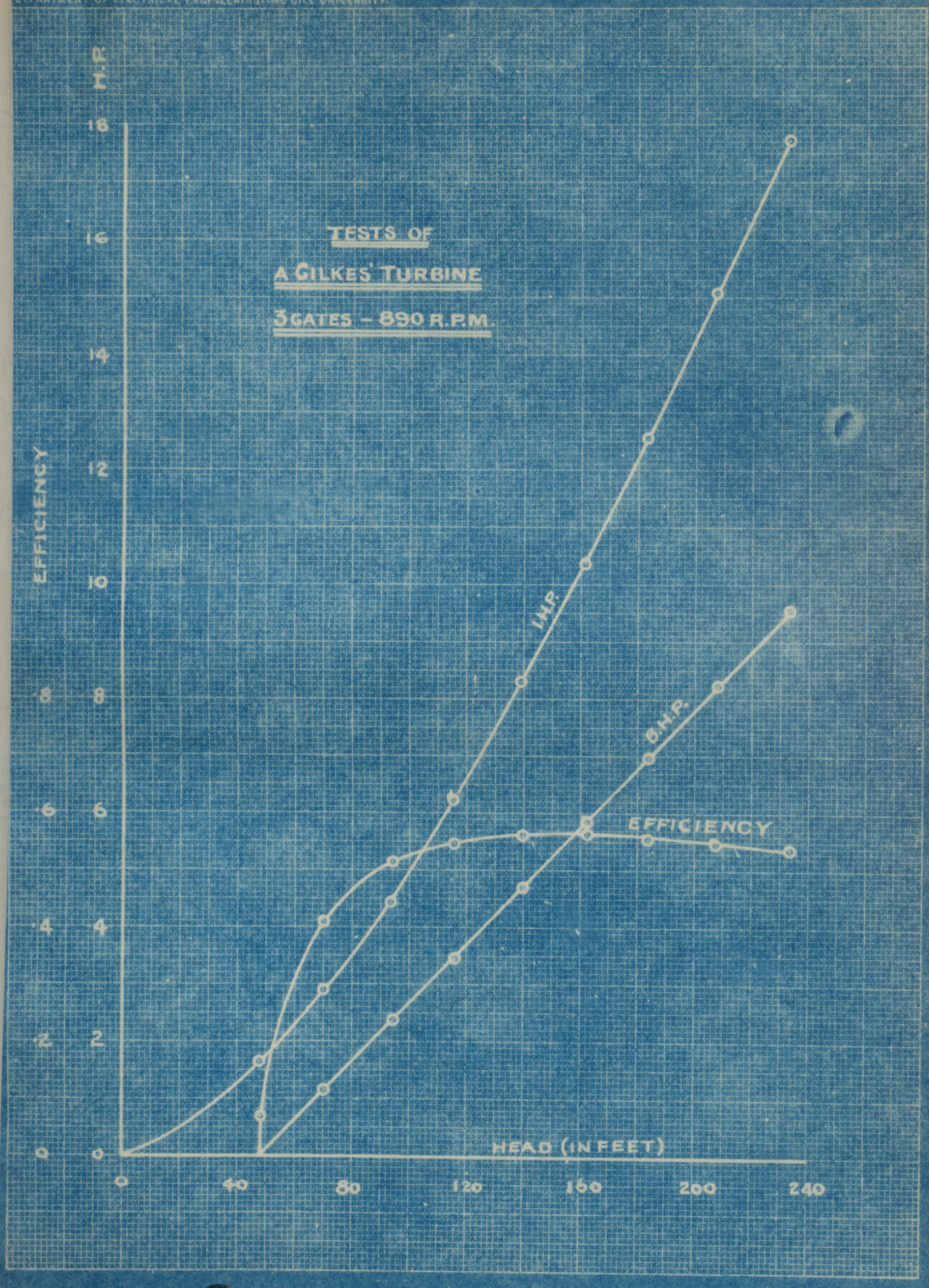
B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

=

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = %

rks:

THIS MARGIN RESERVED FOR BINDING.
IF SHEET IS READ THE LONG WAY (HORIZONTALLY), THE BOOK IS TOP.
IF SHEET IS READ THE OTHER WAY (VERTICALLY), THIS MUST BE LEFT-HAND SIDE.


TESTS OF
A GILKES' TURBINE
3 GATES - 890 R.P.M.
I.H.P.
B.H.P.
EFFICIENCY
EFFICIENCY
I.H.P.
0
2
4
6
8
10
12
14
16
18
HEAD (IN FEET)
0
40
80
120
160
200
240

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Montreal, December 1903

f Gilkes Turbine

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
	Tank #2			0	20	0
	583			0	20	
				0	20	
	Tank #5			0	20	
	399			0	20	7960
	912					

Test No. 68

Average Pressure } 20 lbs./□"

Equivalent Head; Corrected } 47.6 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 1.65

Average effective brake pull (T_1-T_2) } — lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 995

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= —

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = — %

ks: No perceptible brake pull. Turbine ran light at rated speed with is head.

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
	Tank #2			5.5	30	0
	648			6.0	30	
				6.5	30	
	Tank #5			6.0	30	
	482			—	30	7900

Test No. 69

Average Pressure } 30 lbs./□"

Equivalent Head; Corrected } 70.5 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 3.07

Average effective brake pull (T_1-T_2) } 6.0 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 988

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .862

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 28.5 %

rks:

McGILL UNIVERSITY.

HYDRAULIC LABORATORY.

Montreal, December 1903.

f Gilkes Turbine

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
30	Jauk #2			14	40	0
30	711·5			14	40	
0				14·5	40	
30	Jauk #5			13·5	40	
30	585			—	40	7960
	1296·5					

ks:

Test No. 70

Average Pressure } 40 lbs./□"

Equivalent Head; Corrected } 93·55 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 4·6

Average effective brake pull (T_1-T_2) } 14 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 995

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 2·03

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 44·0 %

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
30	Jauk #2			23	50	0
30	767			22	50	
·30				22	50	
·30	Jauk #5			22·5	50	
7·30	681			—	50	7970
	1448					

rks:

Test No. 71

Average Pressure } 50 lbs./□"

Equivalent Head; Corrected } 116·5 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 6·38

Average effective brake pull (T_1-T_2) } 22·3 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 996

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 3·23

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 50·6 %

est of

TIME

10·51·3

53·3

55·3

57·

59·3

emark

TIME

11·08·3

10·3

12·3

14·3

16·3

mark

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HYDRAULIC LABORATORY.

Montreal, December 1903

f Gilkes Turbine

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
30	Jauk #2			29	60	0
30	814			31	60	
30				33	60	
30	Jauk #5			31	60	
30	763			—	60	7910
	1577					

ks:

Test No. 72

Average Pressure } 60 lbs./□″

Equivalent Head; Corrected } 139.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 8.35

Average effective brake pull (T_1-T_2) } 31 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 989

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 4.46

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 53.5 %

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
30	Jauk #2			39.5	70	0
30	867.5			39.0	70	
30				39.0	70	
30	Jauk #5			39.0	70	
30	819.5			—	70	7940
	1687					

rks:

Test No. 73

Average Pressure } 70 lbs./□″

Equivalent Head; Corrected } 161.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 10.34

Average effective brake pull (T_1-T_2) } 39.2 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 993

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 5.62

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 54.2 %

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HYDRAULIC LABORATORY.

Montreal, December 1903

of Gilkes Turbine

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter No. of Rev'ns
o	Tank #2			48·5	80	0
?	930			49·0	80	
o				48·0	80	
2	Tank #5			48·0	80	
4	869			—	80	7890
	1799					

ks:

Test No. 74

Average Pressure } 80 lbs./□″

Equivalent Head; Corrected } 184·25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 12·55

Average effective brake pull (T_1-T_2) } 48·3 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 986

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 6·88

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 54·8 %

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter No. of Rev'ns
4·30	Tank #2			59	90	0
30	975			58	90	
30				58	90	
30	Tank #5			59	90	
30	936			—	90	7880
	1911					

ks:

Test No. 75

Average Pressure } 90 lbs./□″

Equivalent Head; Corrected } 208·25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 15.1

Average effective brake pull (T_1-T_2) } 58·5 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 985

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 8·38

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 55·5 %

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HYDRAULIC LABORATORY.

Montreal, December 1903

F Gilkes Turbine

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
t	Jauk #2			68·5	100	0
,	1032			68·5	100·5	
				68·0	100	
	Jauk #5			68·5	100	
-	989			—	99·5	7960
	2021					

ks:

Test No. 76

Average Pressure } 100 lbs./□"

Equivalent Head; Corrected } 231·75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 17.93

Average effective brake pull (T_1-T_2) } 68·4 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 995

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 9.93

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 55·4 %

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
4	Jauk #2			68	100	0
6	1032			67	100	
8				68	100	
0	Jauk #5			68	100	
2	971			—	100	7950

ks:

Test No. 76 (checked)

Average Pressure } 100 lbs./□"

Equivalent Head; Corrected } 231·75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 17.85

Average effective brake pull (T_1-T_2) } 67·7 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 994

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 9.72

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 54·5 %

End of Set No. IV.

McGILL UNIVERSITY

HYDRAULIC LABORATORY.

Montreal, _____

Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	$T_1 - T_2$	Pressure by Gauge (lbs. / □")	Counter — No. of Rev'ns

Test No. _____

Average Pressure } _____ lbs. / □"

Equivalent Head; Corrected } _____ ft.

Total time _____ secs.

$$\text{I. H. P.} = \frac{\text{Head} \times \text{pounds water used.}}{\text{Time in secs.} \times 550.}$$

$$= _____$$

Average effective brake pull ($T_1 - T_2$) } _____ lbs.

Effective diam'r of brake wheel } _____ ft.

Average R. P. M. _____

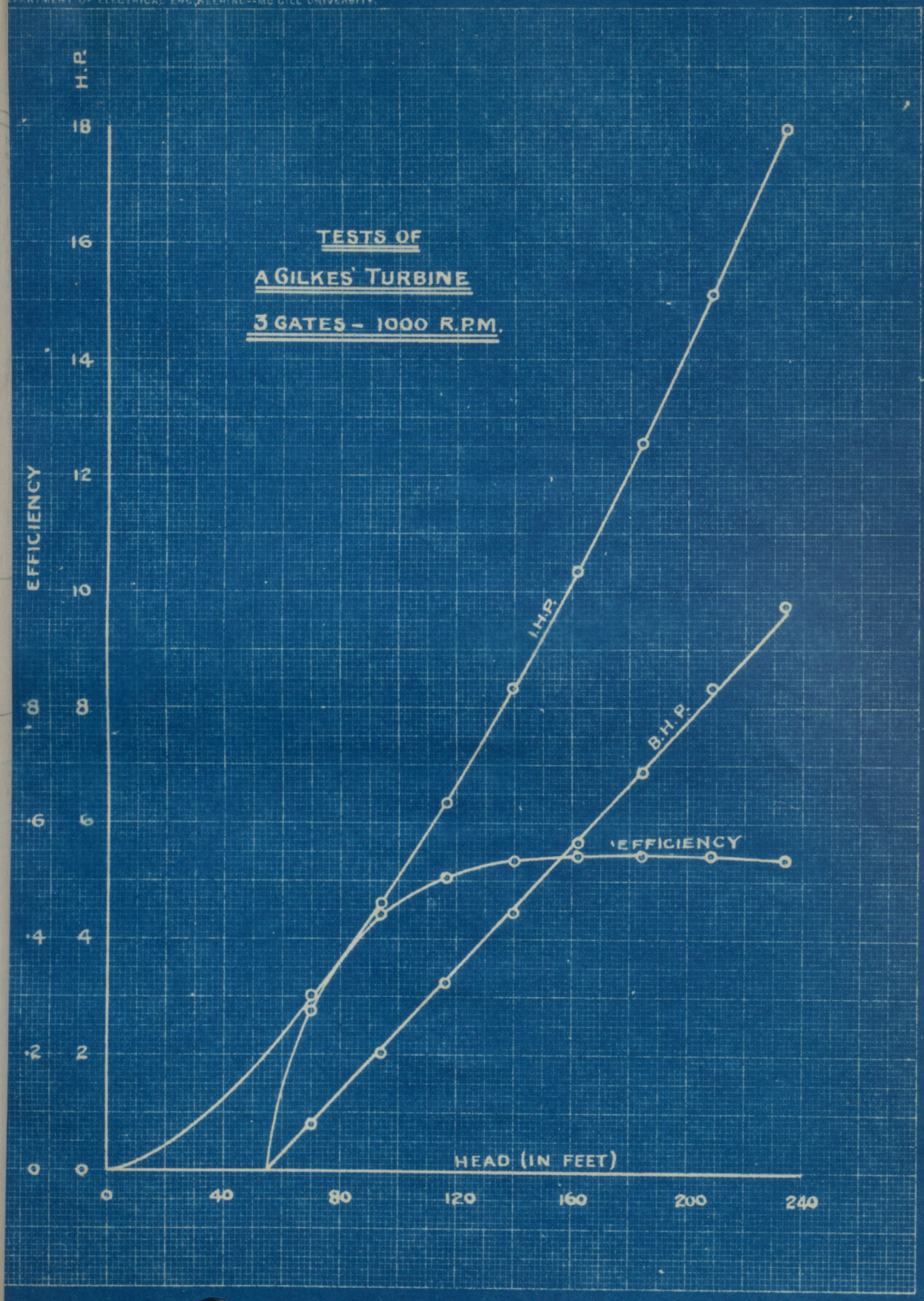
$$\text{B.H.P.} = \frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$$

$$= _____$$

$$\text{Efficiency} = \frac{\text{B.H.P.}}{\text{I.H.P.}} = _____ \%$$

THIS MARGIN RESERVED FOR BINDING.

IF THIS IS TO BE READ THE OTHER WAY (VERTICALLY), THIS MUST BE LEFT-HAND SIDE.


TESTS OF
A GILKES' TURBINE
3 GATES - 1000 R.P.M.
H.P.
EFFICIENCY
I.H.P.
B.H.P.
EFFICIENCY
HEAD (IN FEET)
0
2
4
6
8
10
12
14
16
18
40
80
120
160
200
240

CURVES OF

EFFICIENCY, B. H. P., & I. H. P.

ON

SPEED (R. P. M.-) BASE

THREE GATES OPEN

CURVES OF

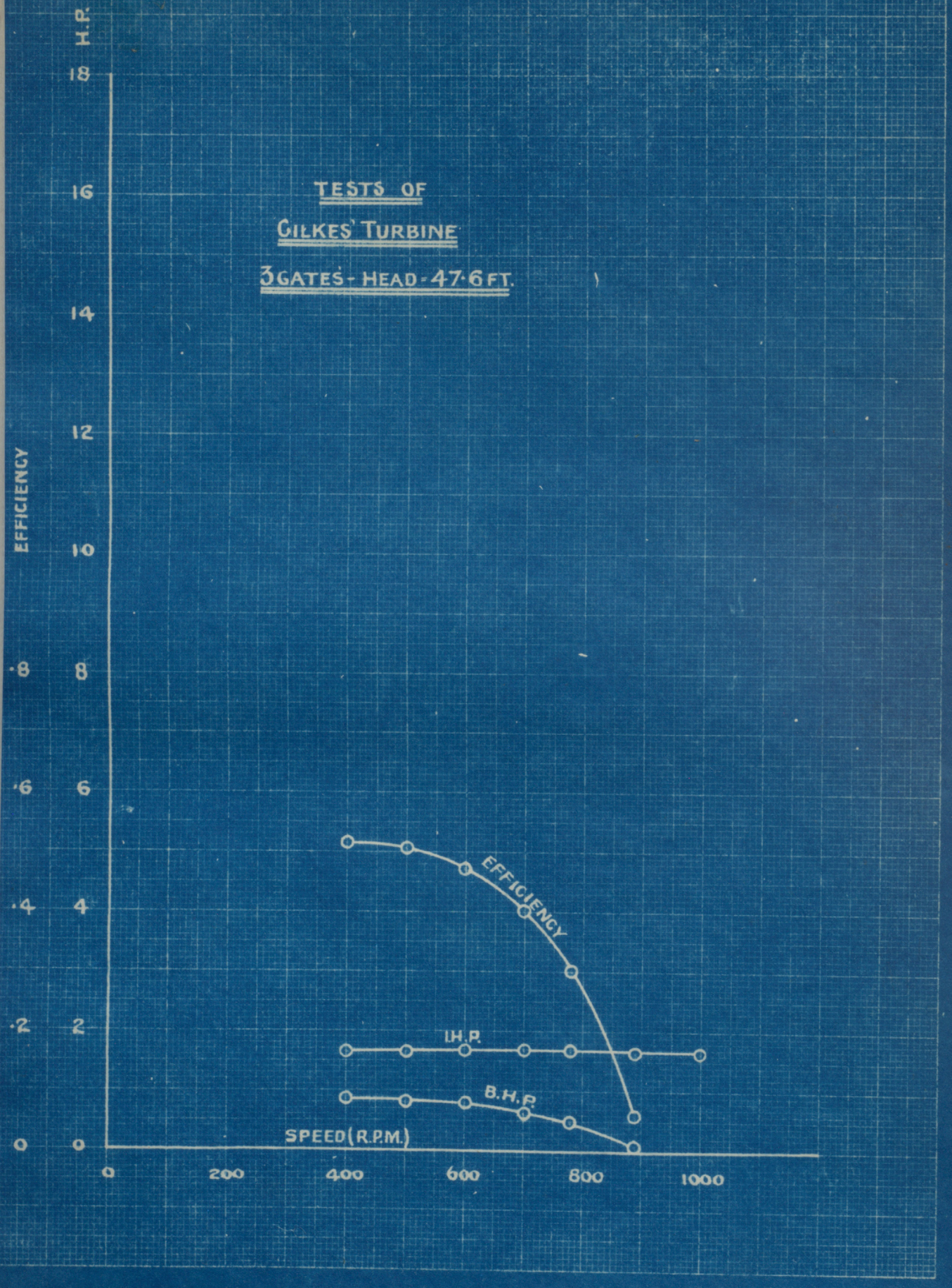
EFFICIENCY, B. H. P., & I. H. P.

ON

SPEED (R. P. M.-) BASE

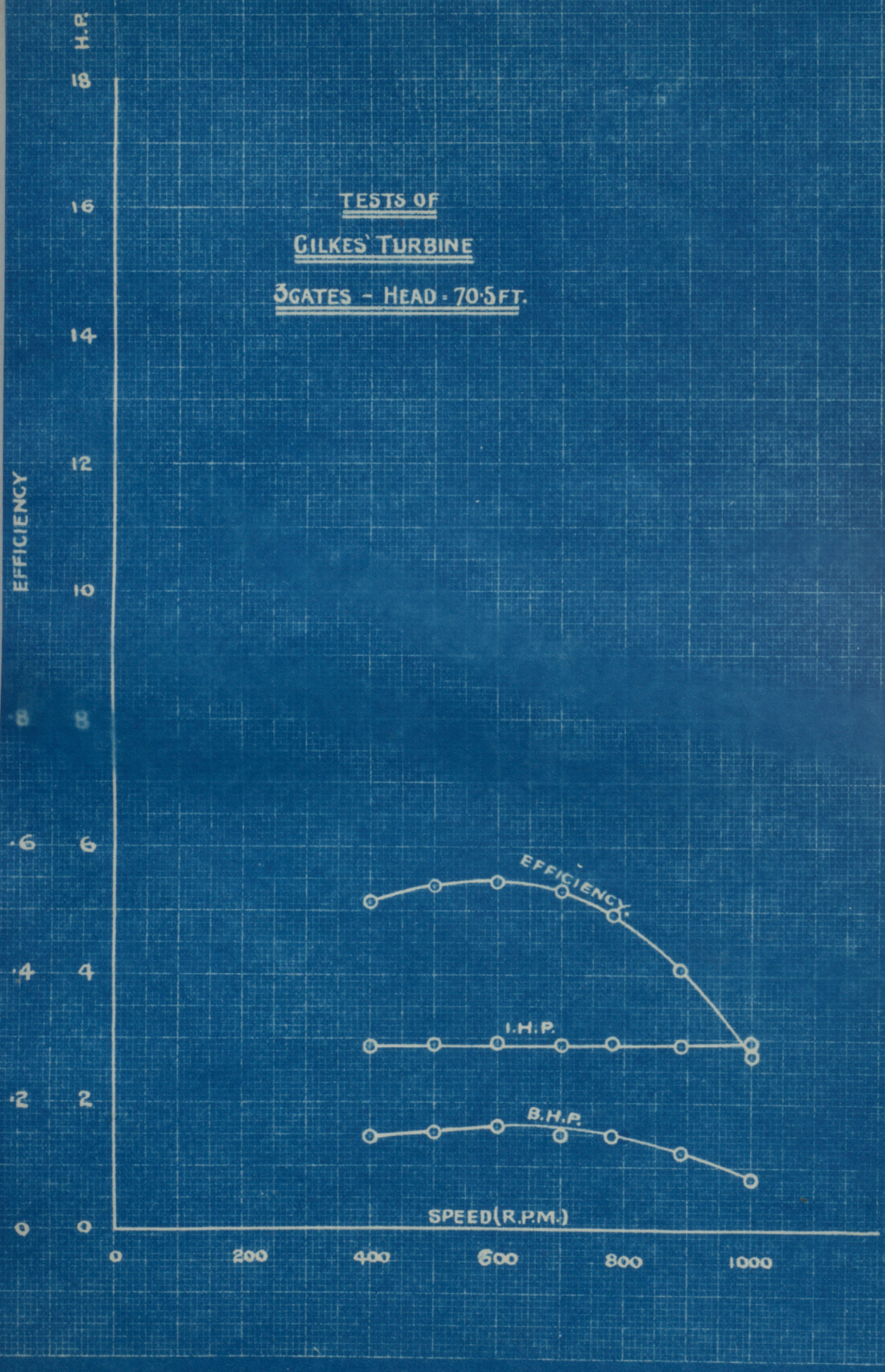
THROW GATES OPEN

TESTS OF
GILKES' TURBINE
3 GATES - HEAD = 47·6 FT.



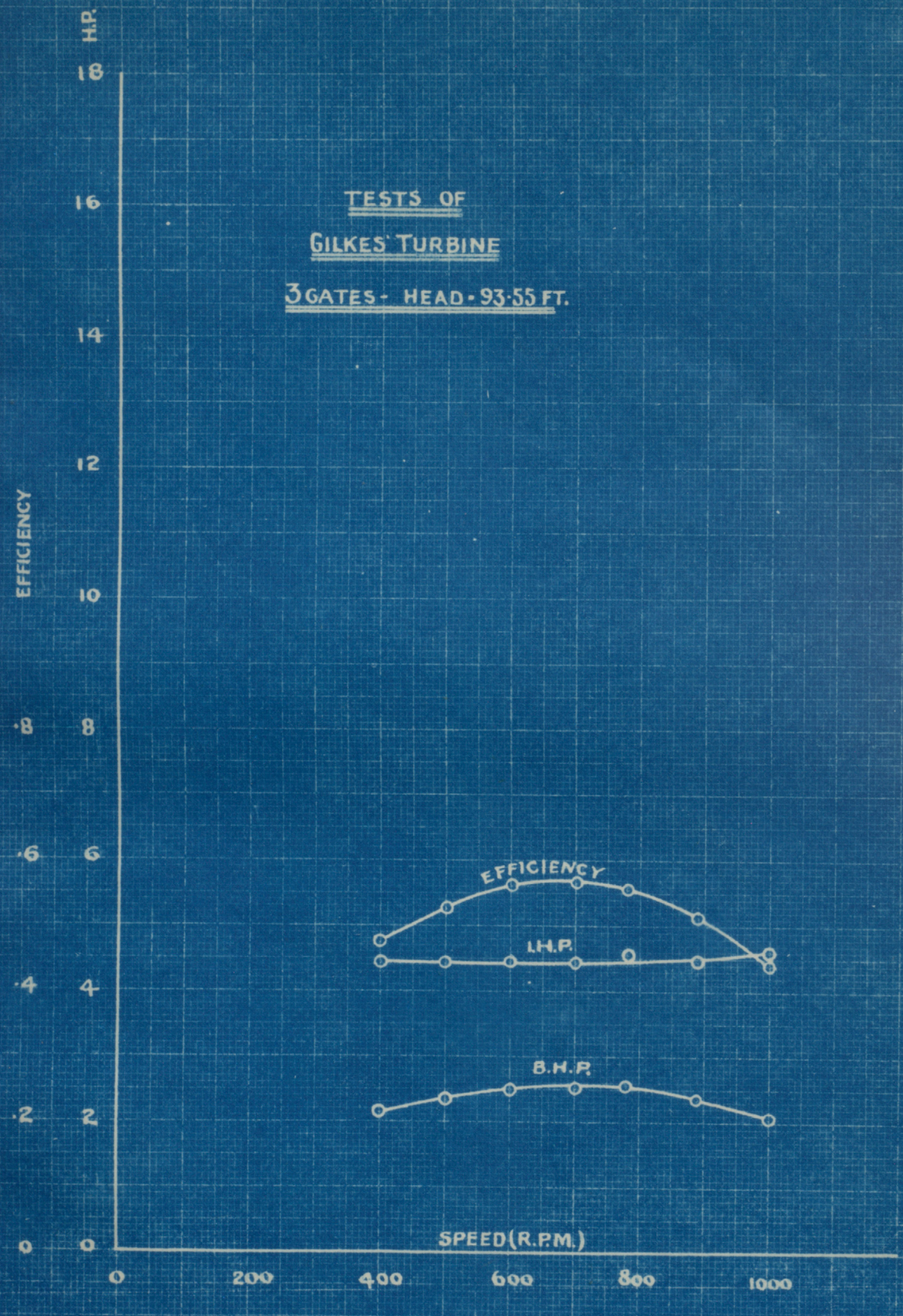
THIS MARGIN RESERVED FOR BINDING.

TESTS OF
GILKES' TURBINE
3 GATES - HEAD = 70·5 FT.



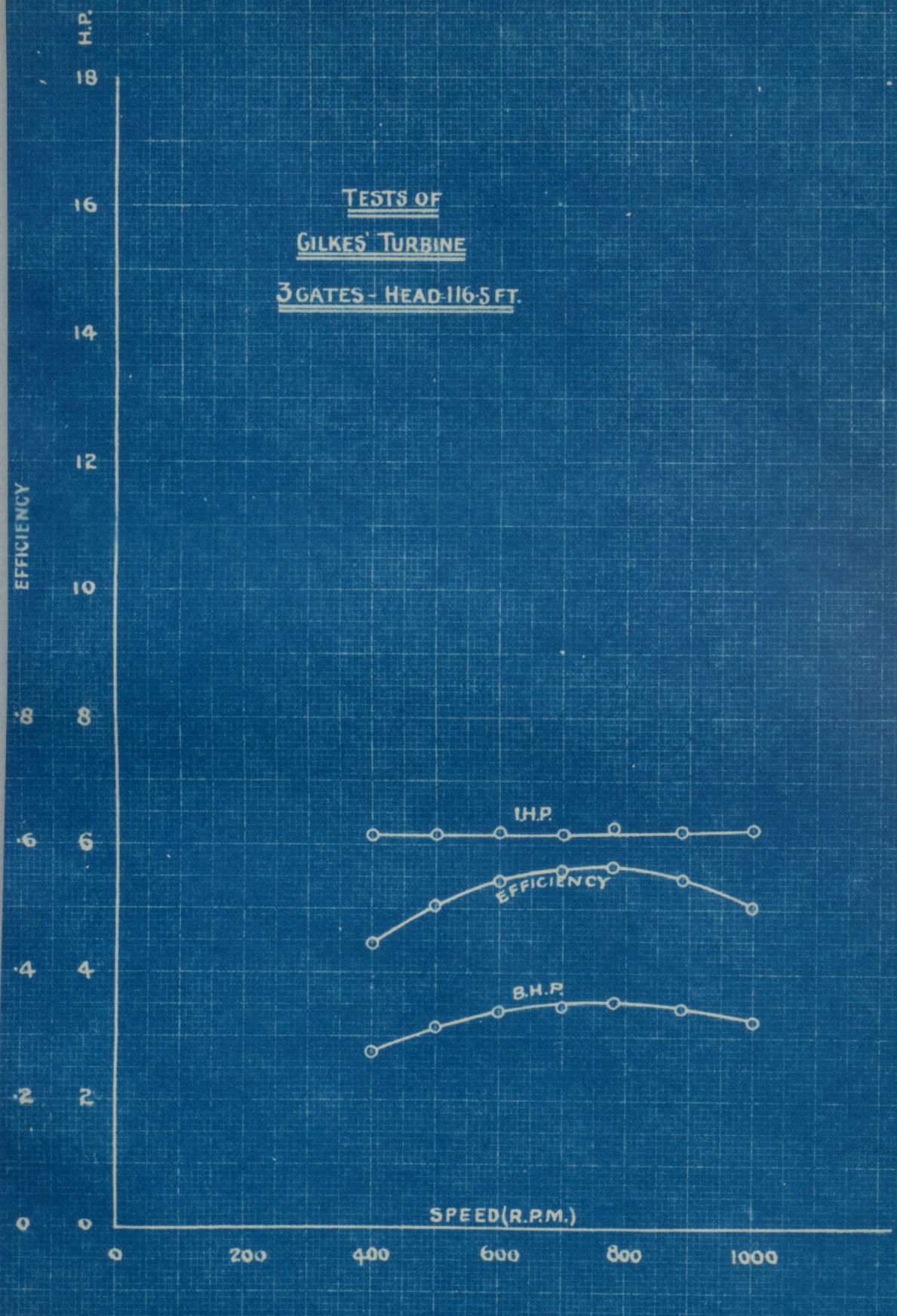
THIS MARGIN RESERVED FOR BINDING.

TESTS OF
GILKES' TURBINE
3 GATES - HEAD - 93·55 FT.

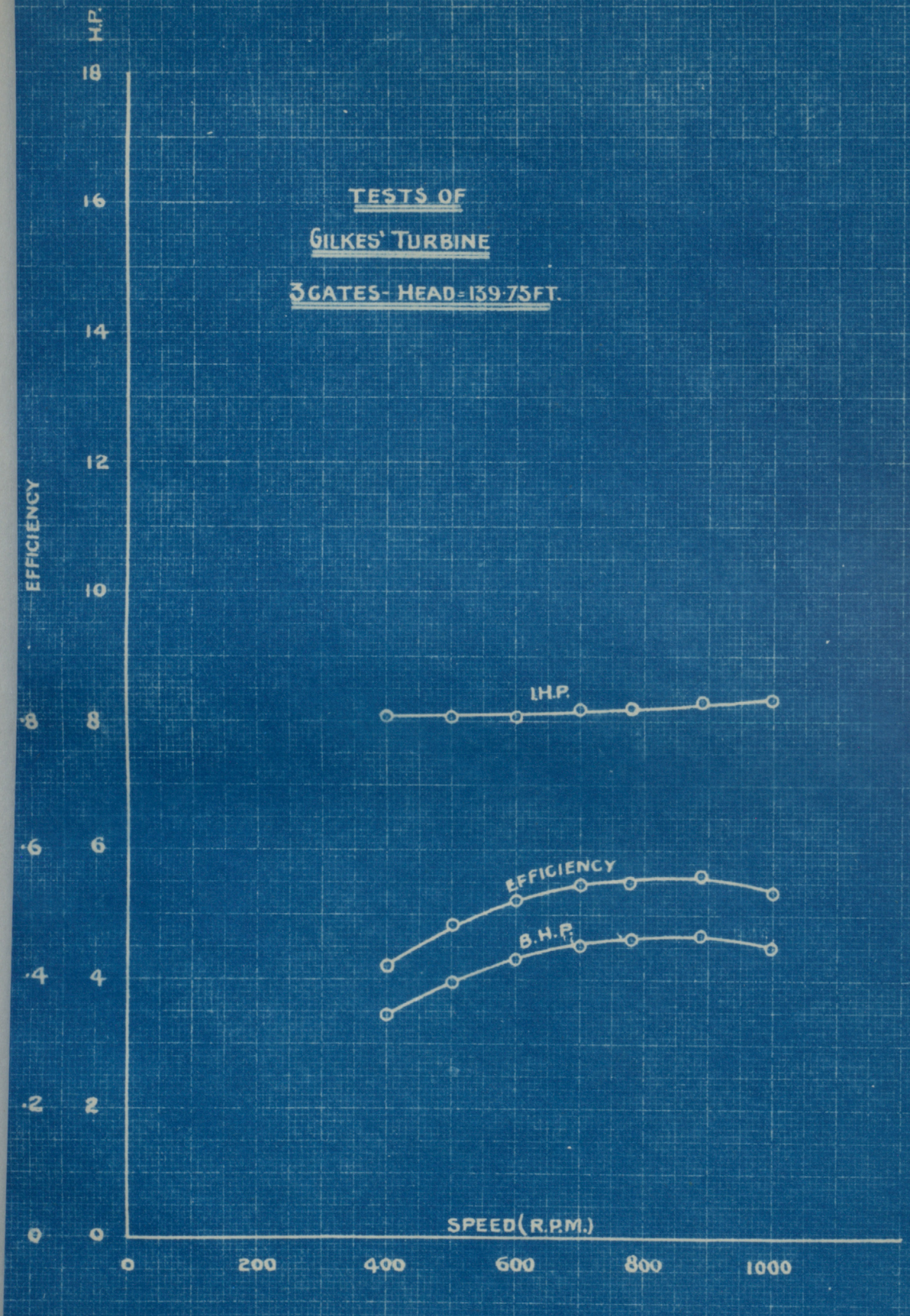


MARGIN RESERVED FOR BINDING.

TESTS OF
GILKES' TURBINE
3 GATES - HEAD 116·5 FT.

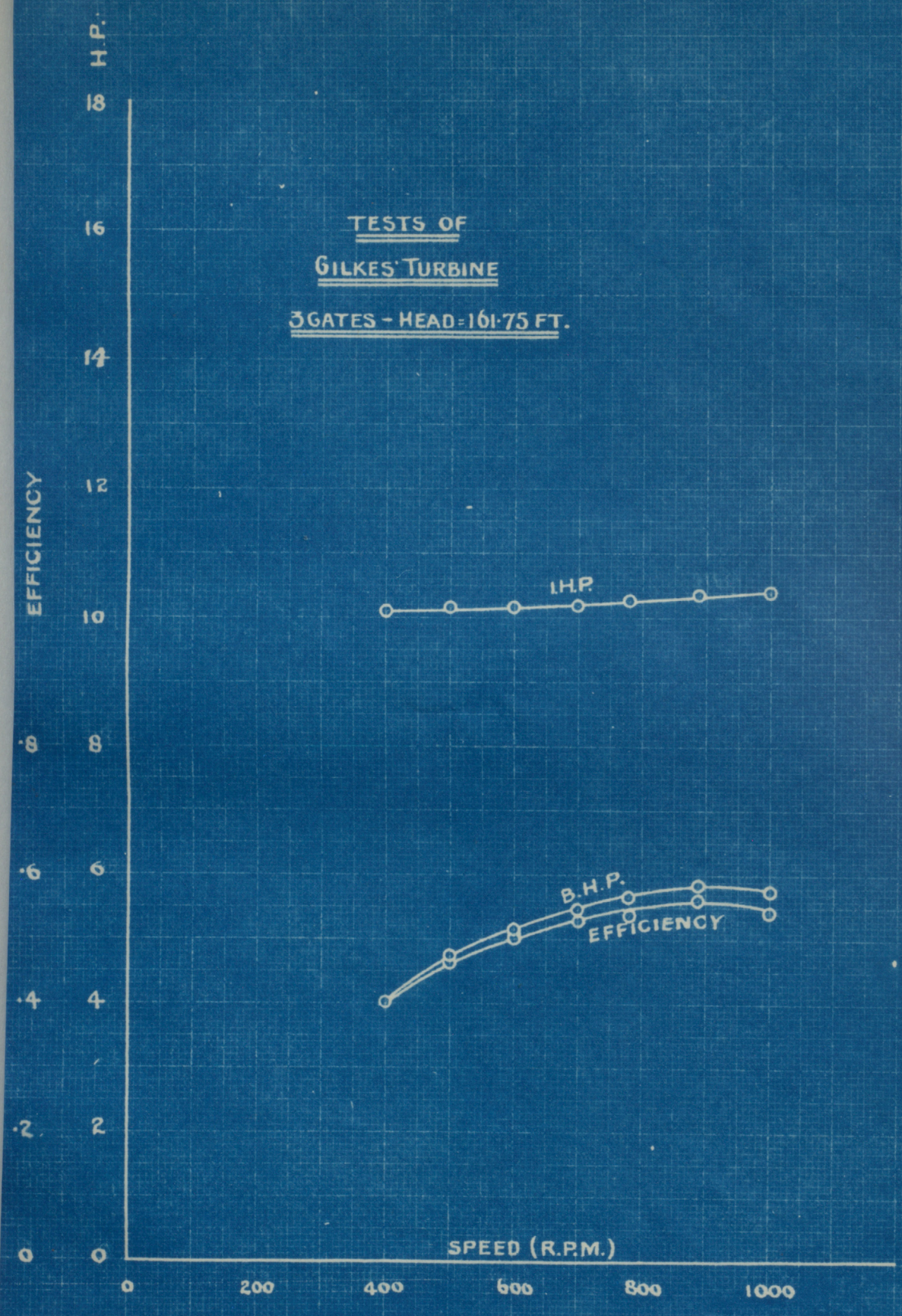


TESTS OF
GILKES' TURBINE
3 GATES - HEAD = 139·75 FT.



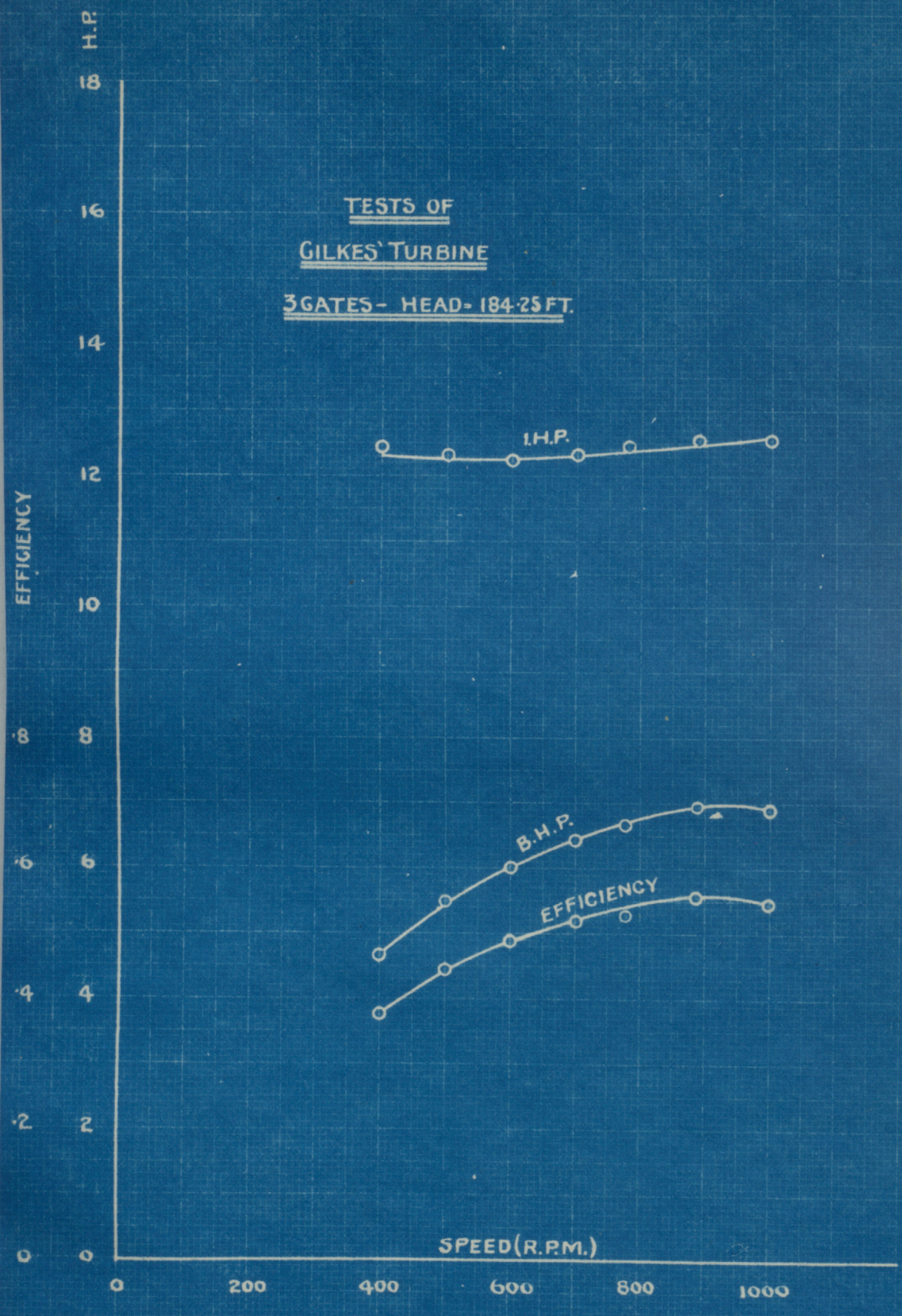
DEPARTMENT OF ELECTRICAL ENGINEERING - MC GILL UNIVERSITY

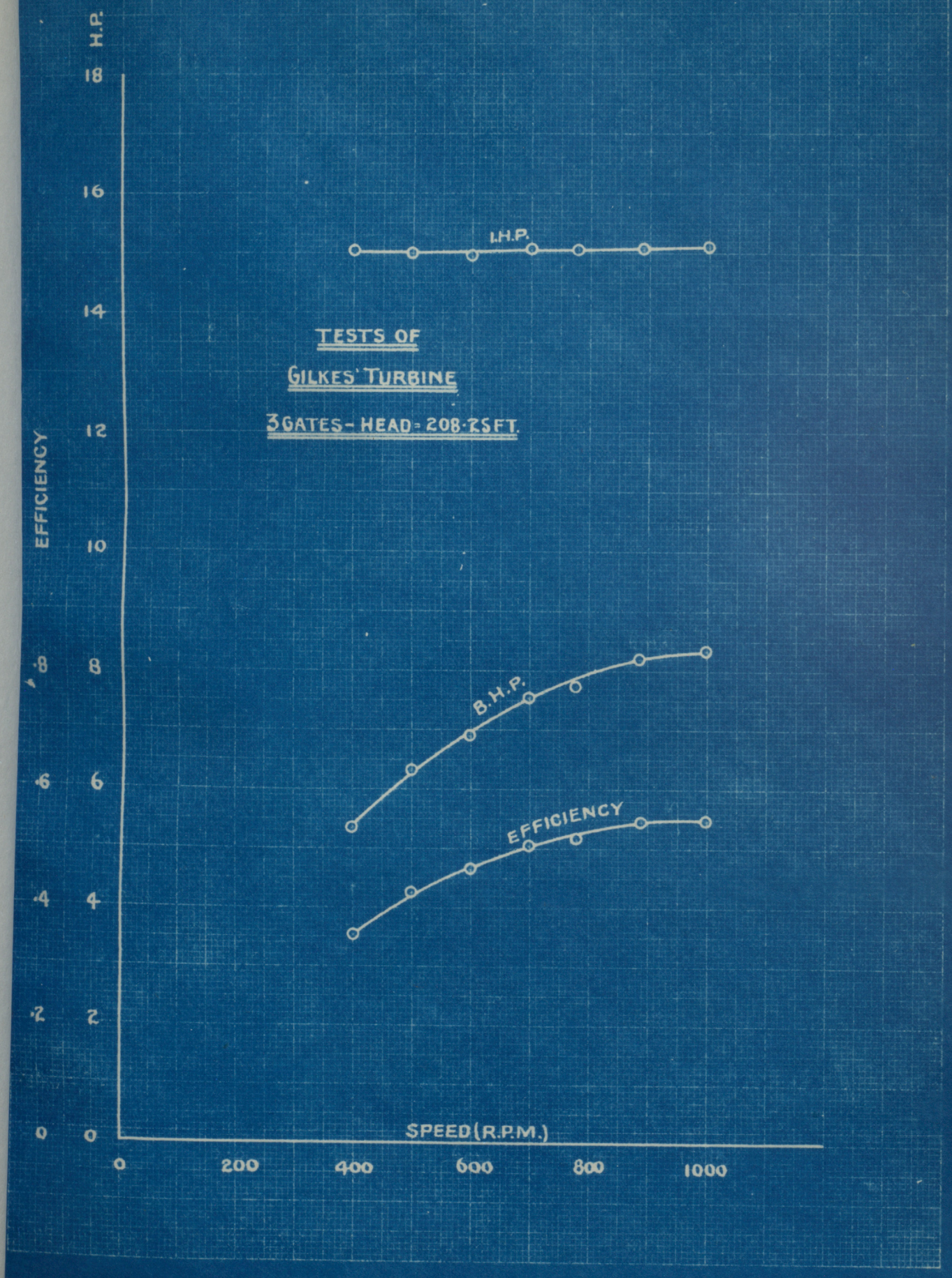
TESTS OF
GILKES' TURBINE
3 GATES - HEAD = 161·75 FT.



PLEASE DO NOT REMOVE SLIP OR BINDING.

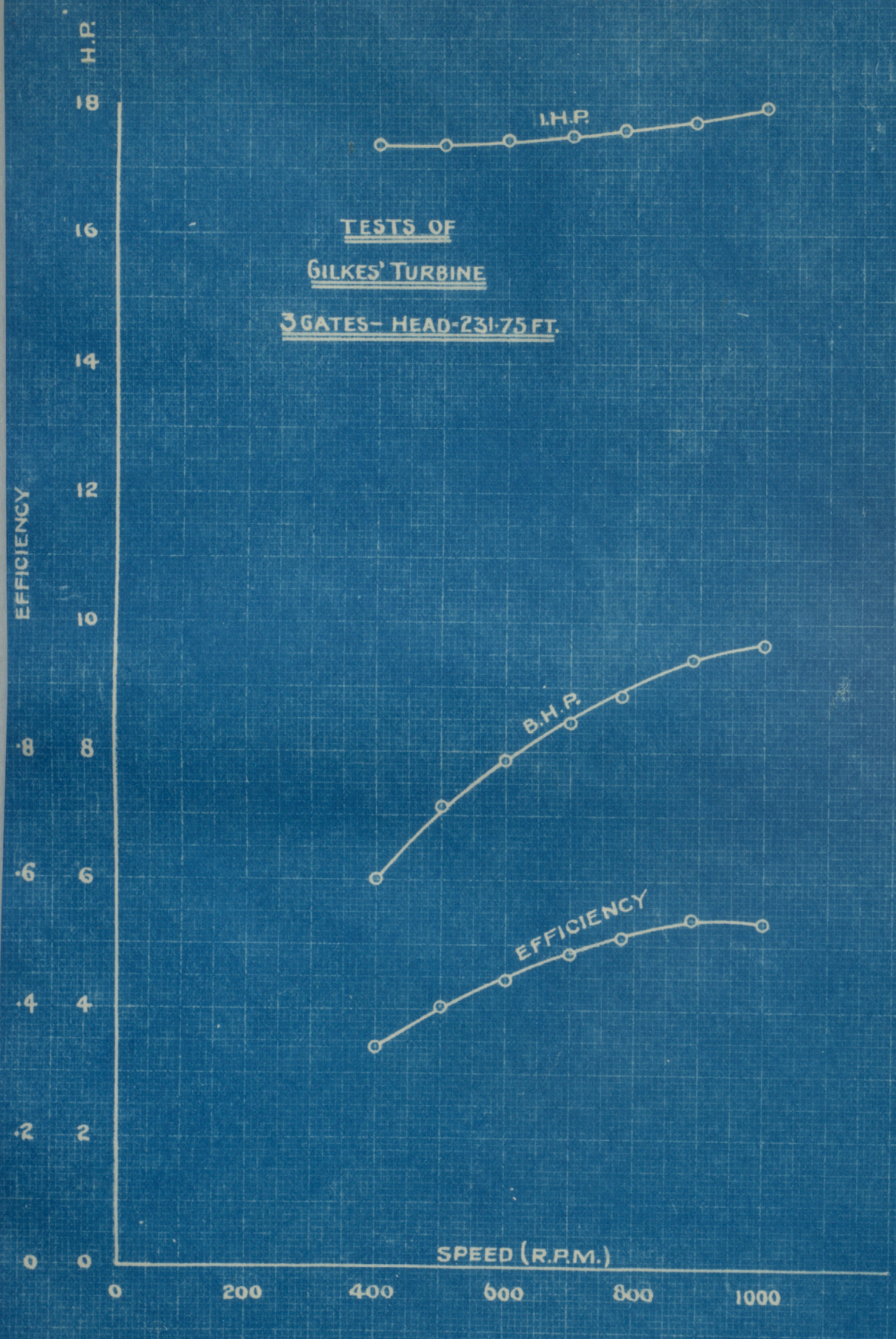
DEPARTMENT OF ELECTRICAL ENGINEERING—McGILL UNIVERSITY.




H.P.
18
16
14
12
10
8
6
4
2
0
EFFICIENCY
·8
·6
·4
·2
0
I.H.P.
TESTS OF
GILKES' TURBINE
3 GATES - HEAD = 208·2 FT.
B.H.P.
EFFICIENCY
SPEED (R.P.M.)
0
200
400
600
800
1000

THIS MARGIN RESERVED FOR BINDING.

EPARTMENT OF ELECTRICAL ENGINEERING-MC GILL UNIVERSITY.



RESULT SHEETS OF

TRIALS ON THE TURBINE

——WITH——

TWO (2) GATES OPEN.

RESULT SHEETS OF

TRIALS ON THE TURBINE

WITH

TWO (2) GATES OPEN.

McGILL UNIVERSITY.

HYDRAULIC LABORATORY.

Montreal, January 10th 1903.

of Gilkes Turbine

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
1	Jauk #2			8·5	20	0
3	462			8·5	20	
5				8·5	20	
1	Jauk #5			8·5	20	
1	109·2			—	20	3200
	571·2					

ks:

Test No. 104

Average Pressure } 20 lbs./□"

Equivalent Head; Corrected } 47·6 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 1·028

Average effective brake pull (T_1-T_2) } 8·5 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 400

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= ·495

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 48·0 %

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
3	Jauk #2			15	30	0
5	514			14·5	30	
7				14·5	30	
9	Jauk #5			14·5	30	
1	173·5			—	30	3215
	687·5					

rks:

Test No. 105

Average Pressure } 30 lbs./□"

Equivalent Head; Corrected } 70·5 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 1·835

Average effective brake pull (T_1-T_2) } 14·62 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 402

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= ·855

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 46·6 %

McGILL UNIVERSITY.

HYDRAULIC LABORATORY.

of Gilkes Turbine. Montreal, January 10th 1904

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
0	Tank #2			22	40	0
2	469			22	40	
4				21.5	40	
6	Tank #5			22	40	
8	309.2			—	40	3192
	778.2					

Test No. 106

Average Pressure } 40 lbs./□″

Equivalent Head; Corrected } 93.55 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 2.76

Average effective brake pull (T_1-T_2) } 21.9 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 399

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 1.27

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 46.0 %

ks:

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
3·30	Tank #2			28.7	50	0
5·30	500			28.5	50	
.30				28.5	50	
.30	Tank #5			28.0	50	
·30	387.5			—	50	3202

Test No. 107

Average Pressure } 50 lbs./□″

Equivalent Head; Corrected } 116.5 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 3.92

Average effective brake pull (T_1-T_2) } 28.4 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 400

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 1.653

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 42.2 %

rks:

McGILL UNIVERSITY.

HYDRAULIC LABORATORY.

Montreal, January 10th 1904

of Gilkes Turbine

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
	Jauk #2			35	60	0
	506.9			35	60	
				35	60	
3	Jauk #5			35	60	
5	449.5			—	60	3200
	956.4					

ks:

Test No. 108

Average Pressure } 60 lbs./□″

Equivalent Head; Corrected } 139.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 5.07

Average effective brake pull (T_1-T_2) } 35 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 400

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 2.035

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 40.1 %

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
7.30	Jauk #2			42	70	0
.30	527			42	70	
30				42	70	
.30	Jauk #5			42	70	
.30	512.6			1 —	70	3200
	1039.6					

rks:

Test No. 109

Average Pressure } 70 lbs./□″

Equivalent Head; Corrected } 161.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 6.36

Average effective brake pull (T_1-T_2) } 42 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 400

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 2.44

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 38.4 %

McGILL UNIVERSITY.

HYDRAULIC LABORATORY.

Montreal, January 10th 1904

of Gilkes Turbine.

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
8	Jack #2			49.25	80	0
)	531			49.0	80	
				49.0	80	
4	Jack #5			49.25	80	
6	553			—	80	3192
	1084					

rks:

Test No. 110

Average Pressure } 80 lbs./□"

Equivalent Head; Corrected } 184.25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 7.58

Average effective brake pull (T_1-T_2) } 49.12 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 399

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 2.84

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 37.5 %

January 12th 1904.

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
2.30	Jack #2			56.0	90	0
.30	562			55.5	90	
30				55.5	90	
30	Jack #5			56.0	90	
30	bog. 2			—	90	3220

rks:

Test No. 111

Average Pressure } 90 lbs./□"

Equivalent Head; Corrected } 208.25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 9.25

Average effective brake pull (T_1-T_2) } 55.75 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 402.5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 3.25

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 35.2 %

McGILL UNIVERSITY.

HYDRAULIC LABORATORY.

Montreal, January 12th 1904

of Gilkes Turbine.

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
0	Tank #2			2·0	10	0
2	355			2·0	10	
4				1·75	10	
6	Tank #5			2·0	10	
8	64			—	10	3210
	419					

rks:

Test No. 112

Average Pressure } 10 lbs./□″

Equivalent Head; Corrected } 24.85 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= .392

Average effective brake pull (T_1-T_2) } 1.94 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 401

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .113

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 28.8 %

January 13th 1904.

	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
30	Tank #2			63·0	100	0
32	574			62.5	100	
34				63·0	100	
36	Tank #5			62.5	100	
38	657			—	100	3195
	1231					

arks:

Test No. 113

Average Pressure } 100 lbs./□″

Equivalent Head; Corrected } 231.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 10.82

Average effective brake pull (T_1-T_2) } 62.75 lbs.

Effective diam'r of brake wheel } 1.528 ft.

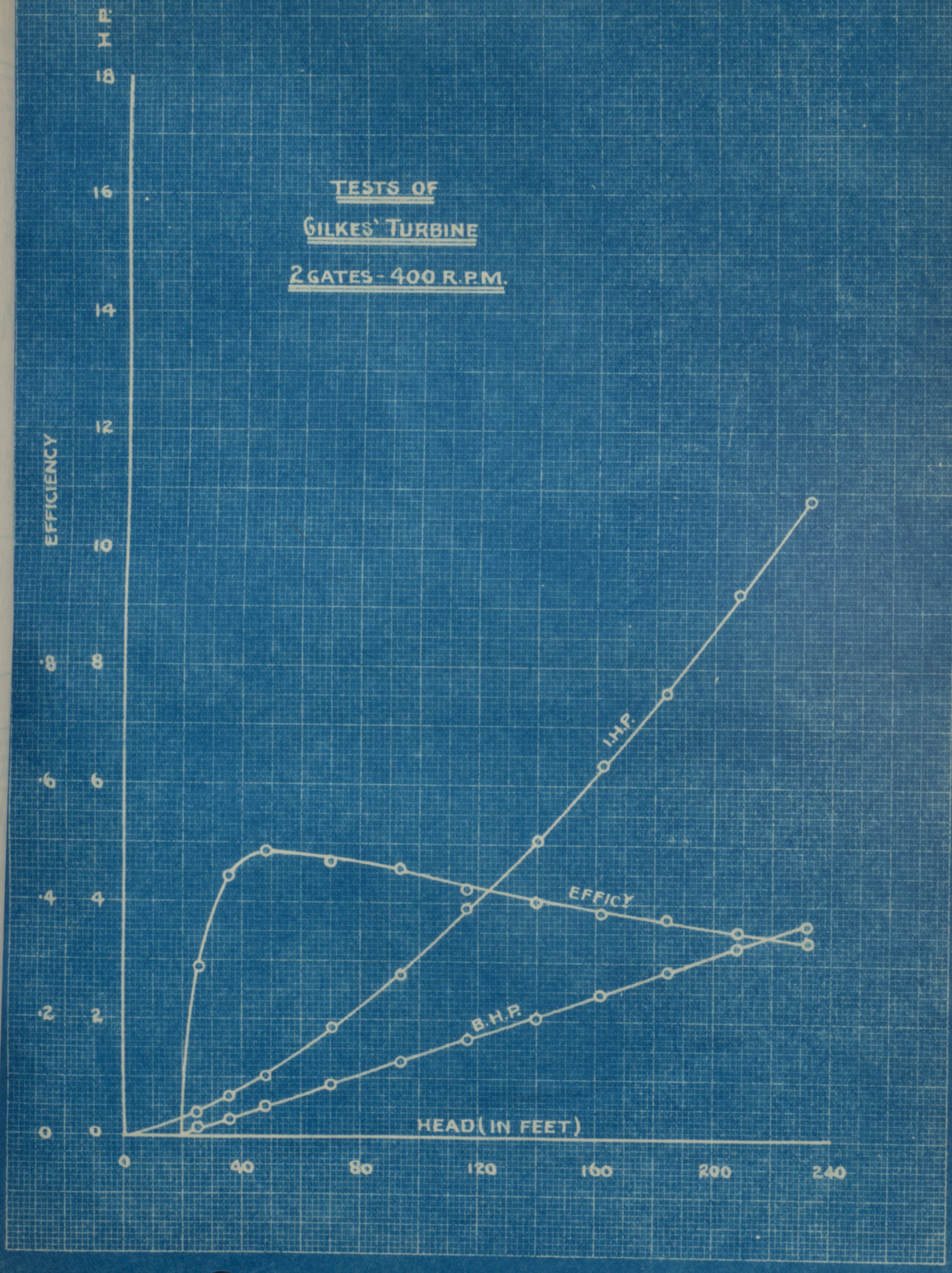
Average R. P. M. 399.4

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 3.65

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 33.7 %

End of Set No VIII.


TESTS OF
GILKES' TURBINE
2 GATES - 400 R.P.M.
H.P.
EFFICIENCY
18
16
14
12
10
8
6
4
2
0
·8
·6
·4
·2
I.H.P.
EFFICY
B.H.P.
HEAD (IN FEET)
0
40
80
120
160
200
240

McGILL UNIVERSITY.

HYDRAULIC LABORATORY.

Montreal, January 14th 1904.

of Gilkes Turbine.

IE	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
.30	Tank #2			.25	10	0
.30	352			.25	10	
.30				.25	10	
30	Tank #5			.25	10	
30	70			Should be = 0.	10	3910
	422					

rks: At 500 revs./min, the turbine just ran light at 10 lbs. pressure. ∴ y at this point = 0.

Test No. 114

Average Pressure } 10 lbs./□"

Equivalent Head; Corrected } 24.85 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= .397

Average effective brake pull (T_1-T_2) } — lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 489

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= —

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = — %

IE	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
.30	Tank #2			5.5	20	0
.30	455			5.5	20	
.30				5.5	20	
.30	Tank #5			5.5	20	
.30	123			—	20	4070
	578					

arks:

Test No. 115

Average Pressure } 20 lbs./□"

Equivalent Head; Corrected } 47.6 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 1.043

Average effective brake pull (T_1-T_2) } 5.5 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 509

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .407

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 39.0 %

McGILL UNIVERSITY.

HYDRAULIC LABORATORY.

Montreal, January 14th 1904.

of Gilkes Turbine.

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
5.30	Jack #2			11.6	30	0
1.30	510			11.6	30	
7.30				11.8	30	
1.30	Jack #5			11.8	30	
3.30	178			–	30	4048
	688					

Test No. 116

Average Pressure } 30 lbs./□″

Equivalent Head; Corrected } 70.55 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 1.837

Average effective brake pull (T_1-T_2) } 11.7 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 506

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .86

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 46.8 %

arks:

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
49	Jack #2			18	40	0
51	359			18.25	40	
53				18.25	40	
55	Jack #5			18.25	40	
57	441			–	40	4020
	800					

Test No. 117

Average Pressure } 40 lbs./□″

Equivalent Head; Corrected } 93.55 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 2.84

Average effective brake pull (T_1-T_2) } 18.2 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 502.5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 1.33

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 46.9 %

arks:

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HYDRAULIC LABORATORY.

of Gilkes Turbine Montreal, January 14th 1904.

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
.30	Jack #2			25.25	50	0
.30	367			25.50	50	
.30				24.50	50	
.30	Jack #5			25.0	50	
.30	510			—	50	4005
	877					

Test No. 118

Average Pressure } 50 lbs./□"

Equivalent Head; Corrected } 116.5 ft.

Total time 480 secs.

I. H. P. = Head x pounds water used. / Time in secs. x 550.

= 3.88

Average effective brake pull (T_1-T_2) } 25.1 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 500.5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 1.824

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 47.0 %

arks:

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
45	Jack #2			31.5	60	0
47	414			32	60	
49				32	60	
57	Jack #5			32	60	
53	552			—	60	4000
	966					

Test No. 119

Average Pressure } 60 lbs./□"

Equivalent Head; Corrected } 139.75 ft.

Total time 480 secs.

I. H. P. = Head x pounds water used. / Time in secs. x 550.

= 5.1

Average effective brake pull (T_1-T_2) } 31.9 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 500

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 2.32

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 45.1 %

arks:

McGILL UNIVERSITY.

HYDRAULIC LABORATORY.

Montreal, January 14th 1904

of Gilkes Turbine.

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
7	Jauk #2			39	70	0
9	432.2			39	70	
1				39	70	
3	Jauk #5			39	70	
5	616.1			—	70	4000
	1048.3					

Test No. 120

Average Pressure } 70 lbs./□″

Equivalent Head; Corrected } 161.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 6.40

Average effective brake pull (T_1-T_2) } 39 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 500

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 2.832

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 44.1 %

rks:

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
4	Jauk #2			45.5	80	0
6	448			45.5	80	
8				45.5	80	
0	Jauk #5			45.5	80	
2	670			—	80	3970
	1118					

Test No. 121

Average Pressure } 80 lbs./□″

Equivalent Head; Corrected } 184.25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 7.76

Average effective brake pull (T_1-T_2) } 45.5 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 496

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 3.285

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 42.2 %

arks:

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HYDRAULIC LABORATORY.

of Gilkes Turbine. Montreal, January 14th 1904

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
3·30	Tank #2			52·5	90	0
5·30	463			52·5	90	
7·30				52·0	90	
9·30	Tank #5			52·2	90	
1·30	720·7			—	90	3960
	1183·7					

Test No. 122

Average Pressure } 90 lbs./□″

Equivalent Head; Corrected } 208·25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$ = 9·33

Average effective brake pull (T_1-T_2) } 52·3 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 495

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$ = 3·77

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 40·45 %

arks:

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
3	Tank #2			59·5	100	0
5	479			59·5	100	
7				59·5	100	
9	Tank #5			59·5	100	
1	773			—	100	3970
	1252					

Test No. 123

Average Pressure } 100 lbs./□″

Equivalent Head; Corrected } 231·75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$ = 10·98

Average effective brake pull (T_1-T_2) } 59·5 lbs.

Effective diam'r of brake wheel } 1·528 ft.

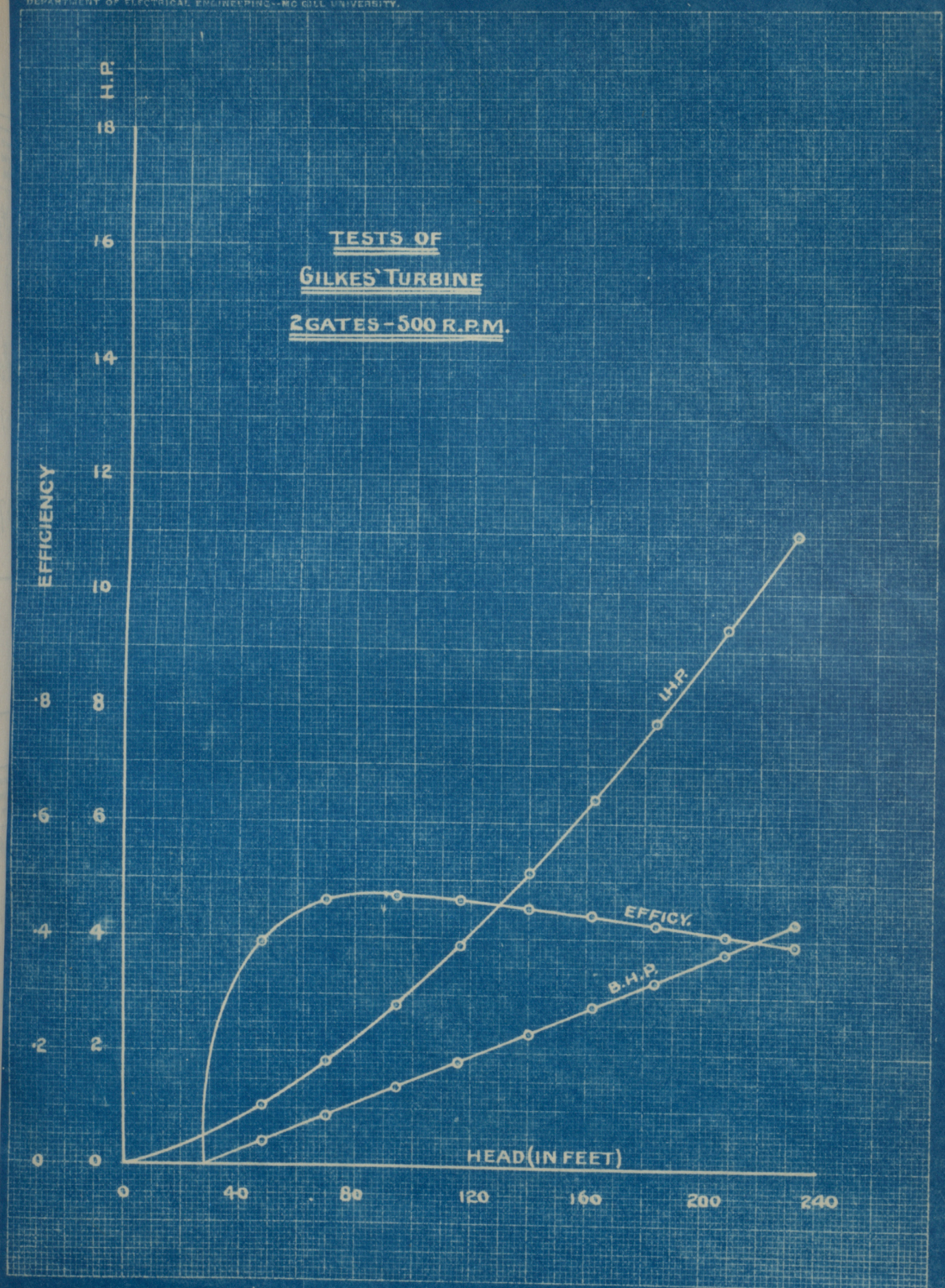
Average R. P. M. 496

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$ = 4·29

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 39·1 %

arks:

End of Set No IX


TESTS OF
GILKES' TURBINE
2 GATES - 500 R.P.M.
H.P.
EFFICIENCY
18
16
14
12
10
8
6
4
2
0
·8
·6
·4
·2
I.H.P.
EFFICY.
B.H.P.
HEAD (IN FEET)
0
40
80
120
160
200
240

McGILL UNIVERSITY.

HYDRAULIC LABORATORY.

Montreal, January 14th 1904

of Gilkes Turbine.

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
2·30	Tank #2			4·3	20	0
·30	400			4·5	20	
·30				4·25	20	
·30	Tank #5			4·25	20	
·30	179				20	4780
	579					

Test No. 124

Average Pressure } 20 lbs./□″

Equivalent Head; Corrected } 47·6 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 1·046

Average effective brake pull (T_1-T_2) } 4·32 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 597·5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= ·3745

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 35·8 %

arks:

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
44	Tank #2			10·5	30	0
6	411			10·25	30	
8				10·5	30	
0	Tank #5			10·25	30	
52	298			—	30	4825
	709					

Test No. 125

Average Pressure } 30 lbs./□″

Equivalent Head; Corrected } 70·5 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 1·89

Average effective brake pull (T_1-T_2) } 10·38 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 603

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= ·91

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 48·1 %

arks:

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HYDRAULIC LABORATORY.

Montreal, January 19th 1904

of Gilkes Turbine.

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
	#2					
24	364			15.5	40	0
6				15.5	40	
8				15.6	40	
0	Jauk #5			15.5	40	
02	392			—	40	4840
	756					

Test No. 126

Average Pressure } 40 lbs./□"

Equivalent Head; Corrected } 93.55 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 2.68

Average effective brake pull (T_1-T_2) } 15.52 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 605

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 1.363

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 50.9 %

rks:

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
4	Jauk #2			22.5	50	0
6	348.5			22.5	50	
8				22.0	50	
0	Jauk #5			22.7	50	
2	508.1			—	50	4825
	856.6					

Test No. 127

Average Pressure } 50 lbs./□"

Equivalent Head; Corrected } 116.5 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 3.78

Average effective brake pull (T_1-T_2) } 22.45 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 602

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 1.96

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 51.5 %

rks:

McGILL UNIVERSITY.

HYDRAULIC LABORATORY.

Montreal, January 21st 1904

of Gilkes Turbine.

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
1	Tank #2			28	60	0
3	407			28	60	
.5				28.2	60	
7	Tank #5			28	60	
29	540			—	60	4850
	947					

Test No. 128

Average Pressure } 60 lbs./□″

Equivalent Head; Corrected } 139.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 5.02

Average effective brake pull (T_1-T_2) } 28.05 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 606

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 2.47

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 49.3 %

rks:

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
7	Tank #2			34.5	70	0
9	475			34.7	70	
4				34.5	70	
3	Tank #5			34.7	70	
5	605			—	70	4890
	1030					

Test No. 129

Average Pressure } 70 lbs./□″

Equivalent Head; Corrected } 161.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 6.32

Average effective brake pull (T_1-T_2) } 34.6 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 611

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 3.07

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 48.6 %

rks:

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HYDRAULIC LABORATORY.

Montreal, January 21st 1904.

of Gilkes Turbine

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
5	Tank #2			40·7	80	0
7	446			41·0	80	
9				41·0	80	
1	Tank #5			41·0	80	
3	664·5			—	80	4840
	1110·5					

rks:

Test No. 130

Average Pressure } 80 lbs./□"

Equivalent Head; Corrected } 184·25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 7·75

Average effective brake pull (T_1-T_2) } 40·95 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 605

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 3·6

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 46·5 %

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
6·30	Tank #2			46.0	90	0
8·30	457·5			47·0	90	
0·30				46·5	90	
2·30	Tank #5			46·5	90	
4·30	695			—	90	4815
	1152					

arks:

Test No. 131

Average Pressure } 90 lbs./□"

Equivalent Head; Corrected } 208·25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 9·1

Average effective brake pull (T_1-T_2) } 46·25 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 602

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 4·07

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 44·8 %

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Montreal, January 21st 1904

of

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
1	Tank #2			53	100	0
3	538			53·4	100	
5				53·5	100	
7	Tank #5			53·5	100	
9	708			—	100	4840
	1246					

Test No. 131-A

Average Pressure } 100 lbs./□″

Equivalent Head; Corrected } 231.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 10.93

Average effective brake pull (T_1-T_2) } 53·35 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 605

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 4.69

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 43·0 %

rks:

End of Set No X.

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns

Test No.

Average Pressure } lbs./□″

Equivalent Head; Corrected } ft.

Total time secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

=

Average effective brake pull (T_1-T_2) } lbs.

Effective diam'r of brake wheel } ft.

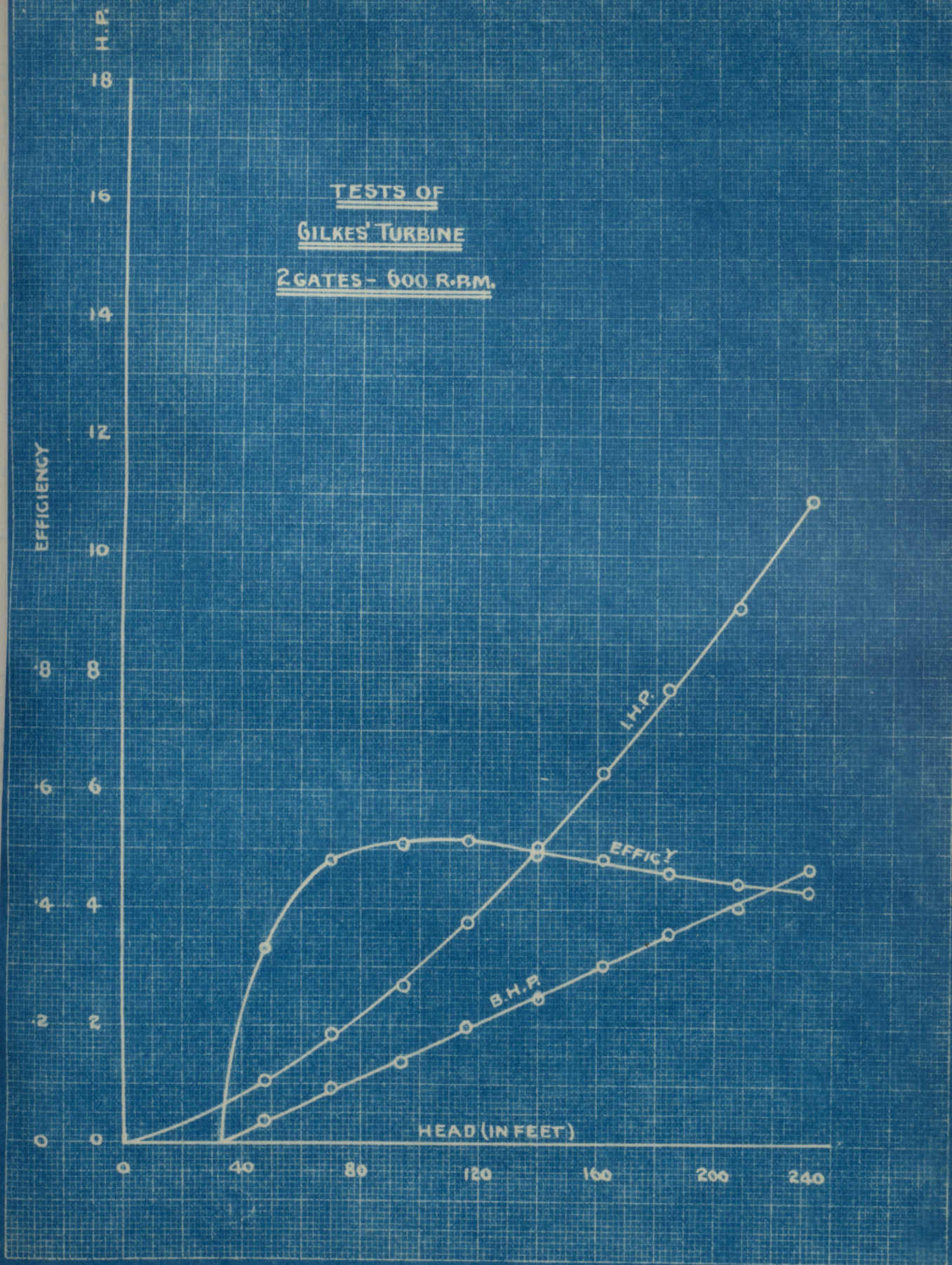
Average R. P. M.

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

=

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = %

arks:


TESTS OF
GILKES' TURBINE
2 GATES - 600 R.P.M.
H.P.
EFFICIENCY
18
16
14
12
10
8
6
4
2
0
I.H.P.
EFFIC.Y
B.H.P.
HEAD (IN FEET)
0
40
80
120
160
200
240

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HYDRAULIC LABORATORY.

Montreal, January 25th 1904

of Gilkes Turbine.

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
.30	Tank #2			2.3	20	0
.30	409			2.25	20	
.30				2.2	20	
.30	Tank #5			2.5	20	
.30	170			—	20	5670
	579					

Test No. 132

Average Pressure } 20 lbs./□"

Equivalent Head; Corrected } 47.6 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 1.05

Average effective brake pull (T_1-T_2) } 2.31 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 709

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .238

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 22.6 %

rks:

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
30	Tank #2			7.75	30	0
.30	414			8.0	30	
.30				8.0	30	
.30	Tank #5			8.0	30	
.30	279			—	30	5615
	693					

Test No. 133

Average Pressure } 30 lbs./□"

Equivalent Head; Corrected } 70.5 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 1.85

Average effective brake pull (T_1-T_2) } 7.94 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 702

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .808

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 43.8 %

rks:

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Montreal, January 25th 1904.

of Gilkes Turbine.

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
8	Sauk #2			14	40	0
0	368 (8/15)			13.8	40	
2				13.8	40	
4	Sauk #5			13.8	40	
6	452.5			–	40	5620
	811.5					

rks:

Test No. 134

Average Pressure } 40 lbs./□"

Equivalent Head; Corrected } 93.55 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 2.87

Average effective brake pull (T_1-T_2) } 13.85 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 702.5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 1.413

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 49.3 %

January 26th 1904.

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
7.30	Sauk #2			20	50	0
.30	390			20	50	
.30				20	50	
.30	Sauk #5			20	50	
.30	488.5			–	50	5610
	878.5					

rks:

Test No. 135

Average Pressure } 50 lbs./□"

Equivalent Head; Corrected } 116.5 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 3.89

Average effective brake pull (T_1-T_2) } 20 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 701

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 2.03

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 52.1 %

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Montreal, January 26 1904

of Gilkes Turbine.

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
8	Tank #2			26	60	0
0	416			25.75	60	
2				26	60	
4	Tank #5			26	60	
6	550			—	60	5600
	966					

Test No. 136

Average Pressure } 60 lbs./□"

Equivalent Head; Corrected } 139.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 5.11

Average effective brake pull (T_1-T_2) } 25.94 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 700

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 2.62

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 51.3 %

arks:

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
0.30	Tank #2			31.7	70	0
4.30	423			31.8	70	
.30				32.0	70	
.30	Tank #5			31.8	70	
.30	612			—	70	5580
	1035					

Test No. 137

Average Pressure } 70 lbs./□"

Equivalent Head; Corrected } 161.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 6.34

Average effective brake pull (T_1-T_2) } 31.82 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 698

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 3.22

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 50.8 %

arks:

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Montreal, January 26th 1904

of Gilkes Turbine.

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
.30	Jauk #2			38	80	0
.30	445			38	80	
30				37.8	80	
.30	Jauk #5			38	80	
.30	665			—	80	5592
	1110					

rks:

Test No. 138

Average Pressure } 80 lbs./□″

Equivalent Head; Corrected } 184.25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 7.755

Average effective brake pull (T_1-T_2) } 37.95 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 699

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 3.85

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 49.7 %

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
9	Jauk #2			44.5	90	0
1	461			44.7	90	
3				44.6	90	
5	Jauk #5			45.0	90	
7	723			—	90	5510
	1184					

rks:

Test No. 139

Average Pressure } 90 lbs./□″

Equivalent Head; Corrected } 208.25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 9.36

Average effective brake pull (T_1-T_2) } 44.7 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 689

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 4.48

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 47.8 %

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Montreal, January 26th 1904.

of Gilkes Turbine.

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
50	Tank #2			51.0	100	0
52	480			50.8	100	
24				50.5	100	
6	Tank #5			51.0	100	
8	769			—	100	5520
	1249					

Test No. 140

Average Pressure } 100 lbs./□"

Equivalent Head; Corrected } 231.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 10.97

Average effective brake pull (T_1-T_2) } 50.8 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 690

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 5.09

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 46.35 %

rks:

End of Set No XI.

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns

Test No.

Average Pressure } lbs./□"

Equivalent Head; Corrected } ft.

Total time secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

=

Average effective brake pull (T_1-T_2) } lbs.

Effective diam'r of brake wheel } ft.

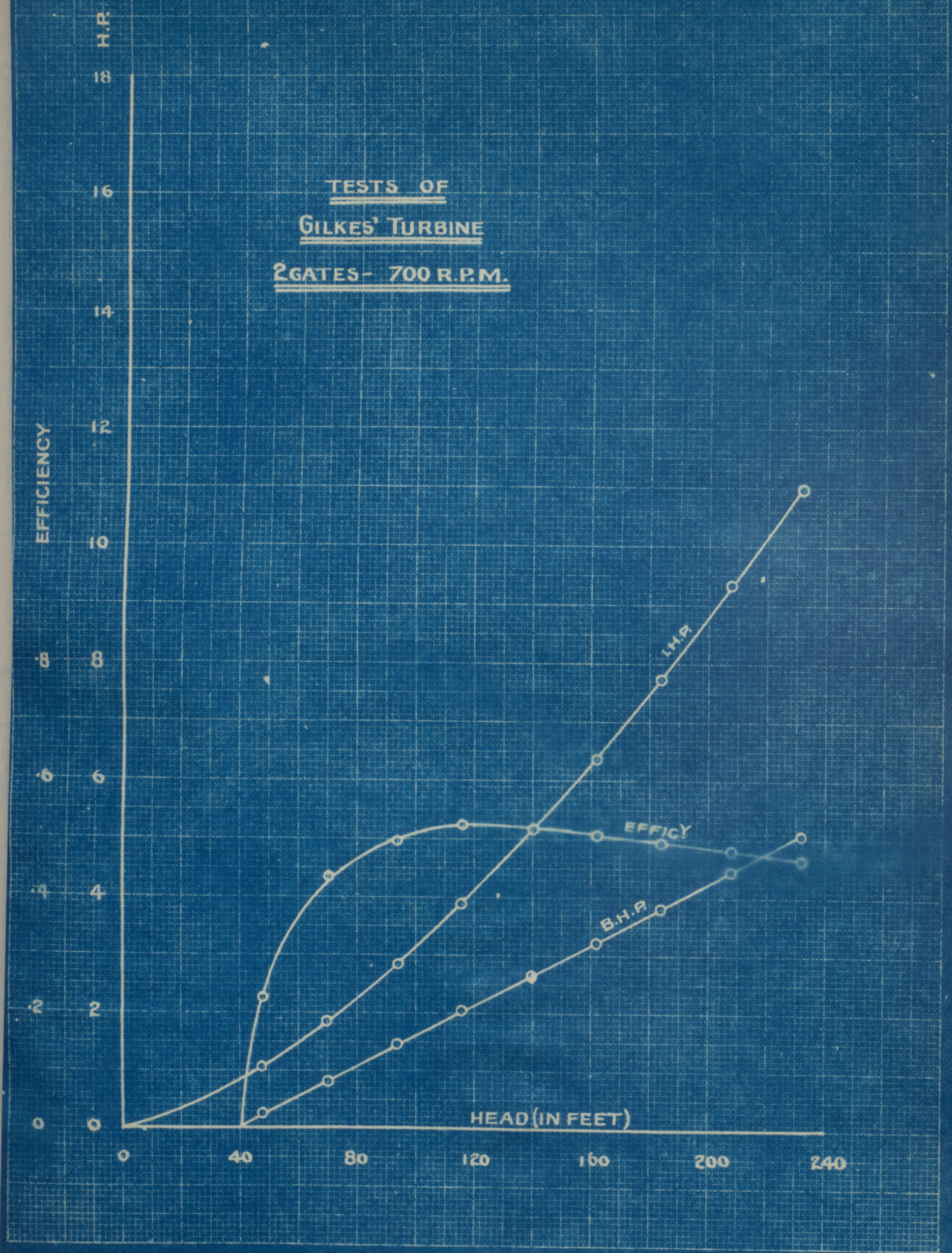
Average R. P. M.

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

=

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = %

rks:


TESTS OF
GILKES' TURBINE
2 GATES - 700 R.P.M.
H.P.
EFFICIENCY
18
16
14
12
10
8
6
4
2
0
8
6
4
2
0
I.H.P.
EFFIC'Y
B.H.P.
HEAD (IN FEET)
0
40
80
120
160
200
240

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Montreal, January 28th 1904.

of Gilkes Turbine

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
.30	Tank #2			1.0	20	0
.30	441.5			1.1	20	
30				1.0	20	
.30	Tank #5			1.0	20	
.30	138			–	20	6420
	579.5					

rks:

Test No. 141

Average Pressure } 20 lbs./□″

Equivalent Head; Corrected } 47.6 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 1.047

Average effective brake pull (T_1-T_2) } 1.0 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 802.5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .116

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 11.1 %

IE	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
6.30	Tank #2			6.0	30	0
.30	414			6.0	30	
.30				6.25	30	
.30	Tank #5			6.25	30	
.30	284			–	30	6450
	698					

arks:

Test No. 142

Average Pressure } 30 lbs./□″

Equivalent Head; Corrected } 70.5 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 1.86

Average effective brake pull (T_1-T_2) } 6.12 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 806

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .716

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 38.5 %

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of Gilkes Turbine. Montreal, January 28th 1904

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
19	Tank #2			11.6	40	0
21	362			10.9	40	
23				11.6	40	
25	Tank #5			11.6	40	
27	449			—	40	6460
	811					

Test No. 143

Average Pressure } 40 lbs./□″

Equivalent Head; Corrected } 93.55 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 2.88

Average effective brake pull (T_1-T_2) } 11.4 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 807.5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 1.347

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 46.7 %

arks:

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
37	Tank #2			17	50	0
39	386			17	50	
41				17	50	
43	Tank #5			17	50	
45	512			—	50	6430
	898					

Test No. 144

Average Pressure } 50 lbs./□″

Equivalent Head; Corrected } 116.5 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 3.96

Average effective brake pull (T_1-T_2) } 17 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 804

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 1.99

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 50.2 %

arks:

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Montreal, January 28th 1904

of Gilkes Turbine.

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter No. of Rev'ns
3·30	Tank #2			23	60	0
·30	414			22·75	60	
·30				22·75	60	
·30	Tank #5			23	60	
·30	565			–	60	6360
	979					

Test No. 145

Average Pressure } 60 lbs./□"

Equivalent Head; Corrected } 139·75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 5·18

Average effective brake pull (T_1-T_2) } 22·9 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 795

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 2·645

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 51·1 %

rks:

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter No. of Rev'ns
8	Tank #2			29	70	0
0	428·7			29	70	
–				29	70	
4	Tank #5			29	70	
6	614·9			–	70	6400
	1043·6					

Test No. 146

Average Pressure } 70 lbs./□"

Equivalent Head; Corrected } 161·75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 6.29

Average effective brake pull (T_1-T_2) } 29 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 800

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 3·37

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 52·8 %

rks:

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Montreal, _____ 19__

Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	$T_1 - T_2$	Pressure by Gauge (lbs. / □")	Counter No. of Revs.

Test No. _____

Average Pressure } _____ lbs. / □"

Equivalent Head; Corrected } _____ ft.

Total time _____ secs.

I. H. P. = $\frac{\text{Head} \times \text{pounds water used}}{\text{Time in secs.} \times 550}$

= _____

Average effective brake pull ($T_1 - T_2$) } _____ lbs.

Effective diam'r of brake wheel } _____ ft.

Average R. P. M. _____

B. H. P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= _____

Efficiency = $\frac{\text{B.H.P.}}{\text{I.H.P.}}$ = _____

REMARKS:

Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	$T_1 - T_2$	Pressure by Gauge (lbs. / □")	Counter No. of Revs.

Test No. _____

Average Pressure } _____ lbs. / □"

Equivalent Head; Corrected } _____ ft.

Total time _____ secs.

I. H. P. = $\frac{\text{Head} \times \text{pounds water used}}{\text{Time in secs.} \times 550}$

= _____

Average effective brake pull ($T_1 - T_2$) } _____ lbs.

Effective diam'r of brake wheel } _____ ft.

Average R. P. M. _____

B. H. P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= _____

Efficiency = $\frac{\text{B.H.P.}}{\text{I.H.P.}}$ = _____

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HYDRAULIC LABORATORY.

Montreal, January 28th/04

of Gilkes Turbine

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
.30	Tank #2			35	80	0
.30	670			35	80	
2.30				34.6	80	
4.30	Tank #5			35	80	
6.30	450			—	80	6380
	1120					

Test No. 147

Average Pressure } 80 lbs./□″

Equivalent Head; Corrected } 184.25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 7.81

Average effective brake pull (T_1-T_2) } 34.9 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 797.5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 4.024

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 51.7 %

arks:

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
+2	Tank #2			41	90	0
+4	493.3			41	90	
+6				41.5	90	
+8	Tank #5			41.2	90	
50	687			—	90	6382
	1180.3					

Test No. 148

Average Pressure } 90 lbs./□″

Equivalent Head; Corrected } 208.25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 9.34

Average effective brake pull (T_1-T_2) } 41.18 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 798

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 4.77

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 51.1 %

arks:

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Montreal,

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HYDRAULIC LABORATORY.

Montreal, January 28th 1904.

of Gilkes Turbine.

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
8·30	Tank #2			47.5	100	0
0-30	511.5			47.8	100	
2·30				47.5	100	
4·30	Tank #5			48.0	100	
6·30	739			—	100	6385
	1250.5					

Test No. 149

Average Pressure } 100 lbs./□″

Equivalent Head; Corrected } 231.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 10.98

Average effective brake pull (T_1-T_2) } 47.7 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 798

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 5.52

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 50.3 %

arks:

End of Set No. XII.

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns

Test No.

Average Pressure } lbs./□″

Equivalent Head; Corrected } ft.

Total time secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

=

Average effective brake pull (T_1-T_2) } lbs.

Effective diam'r of brake wheel } ft.

Average R. P. M.

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

=

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = %

arks:

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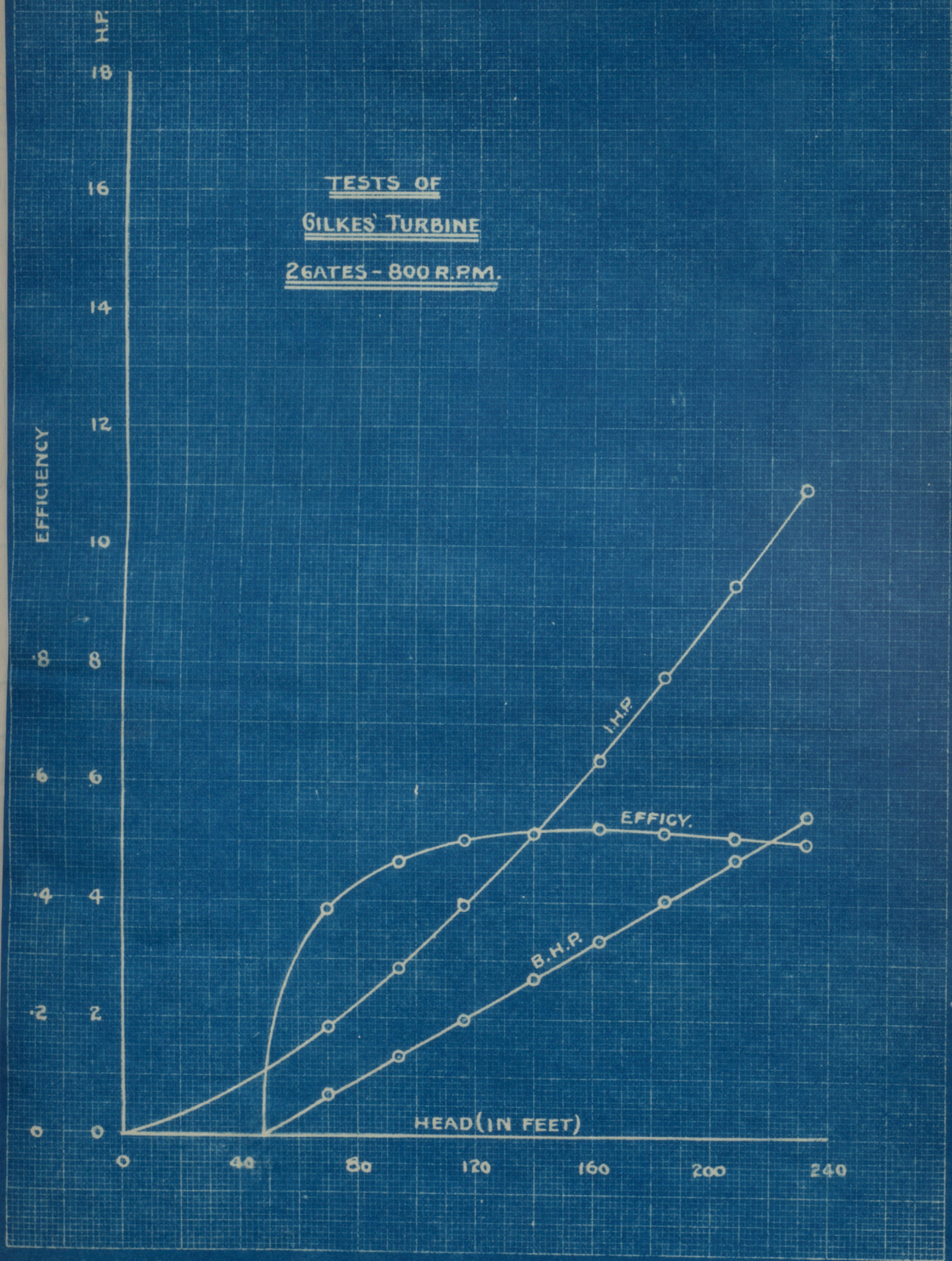
Montreal, ... 19...
Tests of .....
BRAKE READINGS (lbs.)
Amount of Energy Absorbed (H.P.)
T_1
T_2
$T_1 - T_2$
Pressure by Gauge (lbs. □")
Counter — No. of Revs.
Test No. .....
Average Pressure } ..... lbs.
Equivalent Head; Corrected } ..... ft.
Total time ..... secs.
I. H. P. = Head x pounds water used / Time in secs. x 550
= .....
Average effective brake pull ($T_1 - T_2$) } ..... lbs.
Effective diam'r of brake wheel } ..... ft.
Average R. P. M. .....
B. H. P. = π x Eff. pull x Eff. diam. x R.P.M. / 33000
= .....
Efficiency = B.H.P. / I.H.P. = ...
Sheet of Test No. XII
BRAKE READINGS (lbs.)
Amount of Energy Absorbed (H.P.)
T_1
T_2
$T_1 - T_2$
Pressure by Gauge (lbs. □")
Counter — No. of Revs.
Test No. .....
Average Pressure } ..... lbs.
Equivalent Head; Corrected } ..... ft.
Total time ..... secs.
I. H. P. = Head x pounds water used / Time in secs. x 550
= .....
Average effective brake pull ($T_1 - T_2$) } ..... lbs.
Effective diam'r of brake wheel } ..... ft.
Average R. P. M. .....
B. H. P. = π x Eff. pull x Eff. diam. x R.P.M. / 33000
= .....
Efficiency = B.H.P. / I.H.P. = ...

TESTS OF GILKES' TURBINE 26ATES - 800 R.P.M.



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Montreal, January 29th 1904

of Gilkes Turbine.

IE	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
1	Jack #2			4.2	30	0
3	464			4.3	30	
5				4.0	30	
7	Jack #5			4.0	30	
39	242.2			—	30	7150
	710.2					

Test No. 150

Average Pressure } 30 lbs./□"

Equivalent Head; Corrected } 70.5 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 1.894

Average effective brake pull (T_1-T_2) } 4.12 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 894

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .535

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 28.3 %

arks:

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
42	Jack #2			8.75	40	0
44	392			9.0	40	
46				9.1	40	
48	Jack #5			9.25	40	
50	424			—	40	7170
	816					

Test No. 151

Average Pressure } 40 lbs./□"

Equivalent Head; Corrected } 93.55 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 2.893

Average effective brake pull (T_1-T_2) } 9.02 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 896

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 1.174

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 40.6 %

arks:

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Montreal, January 28th/04

of Gilkes Turbine.

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter No. of Rev'ns
11	Jauk #2			15.2	50	0
3	445			15.0	50	
15				14.9	50	
7	Jauk #5			14.9	50	
19	432			–	50	7160
	877					

arks:

Test No. 152

Average Pressure } 50 lbs./□"

Equivalent Head; Corrected } 116.5 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$ = 3.88

Average effective brake pull (T_1-T_2) } 15.0 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 895

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$ = 1.95

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 50.3 %

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter No. of Rev'ns
2	Jauk #2			20.5	60	0
4	455			20.5	60	
6				20.7	60	
8	Jauk #5			20.5	60	
30	503.6			–	60	7135
	958.6					

arks:

Test No. 153

Average Pressure } 60 lbs./□"

Equivalent Head; Corrected } 139.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$ = 5.08

Average effective brake pull (T_1-T_2) } 20.55 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 892

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$ = 2.656

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 52.3 %

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of Gilkes Turbine.

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
2	Tank #2			26.7	70	0
4	466.8			26.5	70	
6				26.3	70	
8	Tank #5			26.5	70	
0	582.8			—	70	7160
	1049.6					

Test No. 154

Average Pressure } 70 lbs./□"

Equivalent Head; Corrected } 161.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 6.43

Average effective brake pull (T_1-T_2) } 26.5 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 895

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 3.445

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 53.6 %

arks:

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
.30	Tank #2			32	80	0
.30	600			31.8	80	
.30				31.7	80	
.30	Tank #5			31.6	80	
.30	583			—	80	7195
	1117					

Test No. 155

Average Pressure } 80 lbs./□"

Equivalent Head; Corrected } 184.25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 7.795

Average effective brake pull (T_1-T_2) } 31.76 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 899.5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 4.15

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 53.2 %

rks:

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Montreal, January 25th /04

of Gilkes Turbine.

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
4	Tank #2			38.3	90	0
6	572.5			38.3	90	
8				38	90	
0	Tank #5			38	90	
2.	612.7			—	90	7150
	1185.2					

Test No. 156

Average Pressure } 90 lbs./□"

Equivalent Head; Corrected } 208.25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 9.36

Average effective brake pull (T_1-T_2) } 38.15 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 894

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 4.955

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 52.9 %

rks:

E	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
.30	Tank #2			44.5	100	0
.30	569			44	100	
4.30				44.2	100	
.30	Tank #5			44	100	
7.30	669			—	100	7115
	1238					

Test No. 157

Average Pressure } 100 lbs./□"

Equivalent Head; Corrected } 231.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 10.88

Average effective brake pull (T_1-T_2) } 44.2 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 890

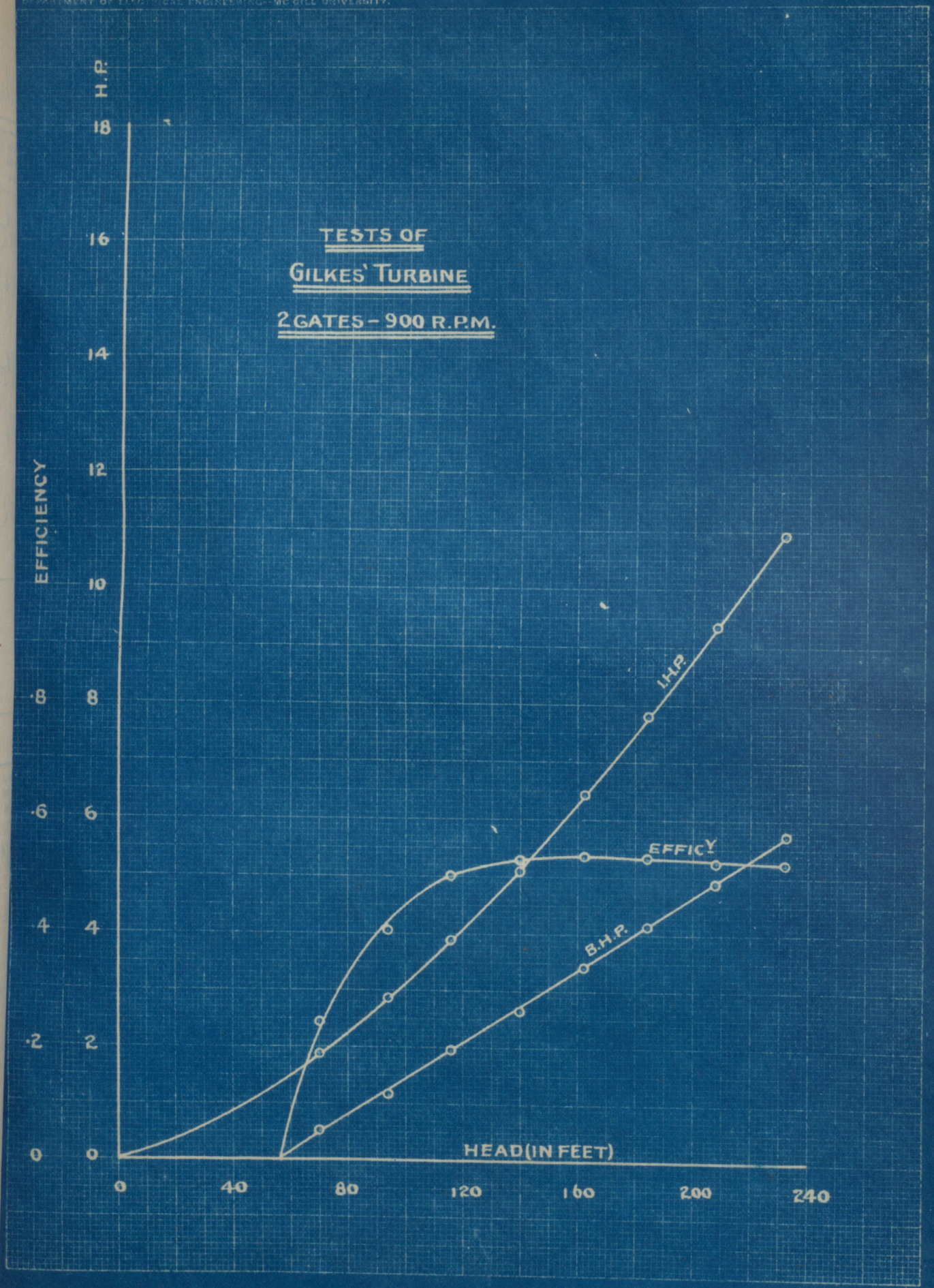
B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 5.72

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 52.5 %

arks:

End of Set No. XIII.


TESTS OF
GILKES' TURBINE
2 GATES - 900 R.P.M.
H.P.
EFFICIENCY
18
16
14
12
10
8
6
4
2
0
·8
·6
·4
·2
I.H.P.
EFFIC.Y
B.H.P.
HEAD (IN FEET)
0
40
80
120
160
200
240

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Montreal, January 28th 1904

of Gilkes Turbine

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter No. of Rev'ns
-9	Tank #2			2.0	30	0
51	464.4			1.8	30	
53				2.0	30	
55	Tank #5			2.0	30	
57	231.0			—	30	8050
	695.4					

arks:

Test No. 158

Average Pressure } 30 lbs./□"

Equivalent Head; Corrected } 70.5 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 1.86

Average effective brake pull (T_1-T_2) } 1.95 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 1006

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .2845

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 15.3 %

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter No. of Rev'ns
9	Tank #2			7.5	40	0
01	318.4			7.2	40	
03				7.3	40	
05	Tank #5			7.3	40	
07	511.5			—	40	8008
	829.9					

arks:

Test No. 159

Average Pressure } 40 lbs./□"

Equivalent Head; Corrected } 93.55 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 2.845

Average effective brake pull (T_1-T_2) } 7.32 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 1001

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 1.066

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 37.5 %

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Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	$T_1 - T_2$	Pressure by Gauge (lbs. / □")	Counter No. of Rev'ns

Test No.

Average Pressure } lbs. / □"

Equivalent Head; Corrected } ft.

Total time secs.

I. H. P. = $\frac{\text{Head} \times \text{pounds water used.}}{\text{Time in secs.} \times 550.}$

Average effective brake pull ($T_1 - T_2$) } lbs.

Effective diam'r of brake wheel } ft.

Average R. P. M.

B. H. P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R. P. M.}}{33000}$

Efficiency = $\frac{\text{B. H. P.}}{\text{I. H. P.}}$ =

Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	$T_1 - T_2$	Pressure by Gauge (lbs. / □")	Counter No. of Rev'ns

Test No.

Average Pressure } lbs. / □"

Equivalent Head; Corrected } ft.

Total time secs.

I. H. P. = $\frac{\text{Head} \times \text{pounds water used.}}{\text{Time in secs.} \times 550.}$

Average effective brake pull ($T_1 - T_2$) } lbs.

Effective diam'r of brake wheel } ft.

Average R. P. M.

B. H. P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R. P. M.}}{33000}$

Efficiency = $\frac{\text{B. H. P.}}{\text{I. H. P.}}$ =

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Montreal, January 28th 04

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ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
15	Jauk #2			12.2	50	0
17	306.9			11.8	50	
19				12.1	50	
21	Jauk #5			12.0	50	
23	591.0			—	50	7980
	897.9					

Test No. 160

Average Pressure } 50 lbs./□"

Equivalent Head; Corrected } 116.5 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 3.95

Average effective brake pull (T_1-T_2) } 12.02 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 997.5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 1.742

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 44.1 %

arks:

IME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
6.30	Jauk #2			17.1	60	0
8.30	602.5			17.0	60	
0.30				17.1	60	
2.30	Jauk #5			17.4	60	
4.30	380.5			—	60	7965

Test No. 161

Average Pressure } 60 lbs./□"

Equivalent Head; Corrected } 139.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 5.19

Average effective brake pull (T_1-T_2) } 17.15 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 996

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 2.485

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 47.9 %

arks:

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Montreal, January 28th 04

of Gilkes Turbine.

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
4	Tank #2			22.5	70	0
6	564.5			22.5	70	
8				22.3	70	
0	Tank #5			22.3	70	
2	483			—	70	7965
	1047.5					

Test No. 162

Average Pressure } 70 lbs./□"

Equivalent Head; Corrected } 161.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 6.42

Average effective brake pull (T_1-T_2) } 22.4 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 996

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 3.24

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 50.5 %

arks:

January 29th 04

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
21	Tank #2			28	80	0
23	524.2			28	80	
25				28.2	80	
27	Tank #5			28.2	80	
29	600			—	80	8020
	1124.2					

Test No. 163

Average Pressure } 80 lbs./□"

Equivalent Head; Corrected } 184.25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 786

Average effective brake pull (T_1-T_2) } 28.1 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 1002.5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 4.1

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 52.1 %

arks:

McGILL UNIVERSITY

HYDRAULIC LABORATORY.

Montreal,

Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	$T_1 - T_2$	Pressure by Gauge (lbs. / □")	Counter — No. of Rev'ns

Test No.

Average Pressure } lbs. / □"

Equivalent Head; Corrected } ft.

Total time secs.

$$I.H.P. = \frac{\text{Head} \times \text{pounds water used.}}{\text{Time in secs.} \times 550.}$$

$$= \qquad\qquad$$

Average effective brake pull $(T_1 - T_2)$ lbs.

Effective diam'r of brake wheel ft.

Average R. P. M.

$$B.H.P. = \frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$$

$$= \qquad\qquad$$

$$\text{Efficiency} = \frac{B.H.P.}{I.H.P.} = \qquad\qquad$$

Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	$T_1 - T_2$	Pressure by Gauge (lbs. / □")	Counter — No. of Rev'ns

Test No.

Average Pressure } lbs. / □"

Equivalent Head; Corrected } ft.

Total time secs.

$$I.H.P. = \frac{\text{Head} \times \text{pounds water used.}}{\text{Time in secs.} \times 550.}$$

$$= \qquad\qquad$$

Average effective brake pull $(T_1 - T_2)$ lbs.

Effective diam'r of brake wheel ft.

Average R. P. M.

$$B.H.P. = \frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$$

$$= \qquad\qquad$$

$$\text{Efficiency} = \frac{B.H.P.}{I.H.P.} = \qquad\qquad$$

McGILL UNIVERSITY.

HYDRAULIC LABORATORY.

Montreal, January 29th 1904.

of Gilkes Turbine

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
4.30	Jauk #2			33.6	90	0
.30	551.8			34.0	90	
3.30				34.0	90	
0.30	Jauk #5			33.8	90	
2.30	657.5			—	90	8070
	1209.3					

Test No. 164

Average Pressure } 90 lbs./□"

Equivalent Head; Corrected } 208.25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 9.53

Average effective brake pull (T_1-T_2) } 33.85 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 1009

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 4.96

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 52.1 %

arks:

ME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
49	Jauk #2			40	100	0
51	564.5			39.5	100	
53				40	100	
55	Jauk #5			40	100	
57	689.5			—	100	8060
	1254					

Test No. 165

Average Pressure } 100 lbs./□"

Equivalent Head; Corrected } 231.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 11.00

Average effective brake pull (T_1-T_2) } 39.9 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 1007.5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 5.84

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 53.0 %

arks:

End of Set No XIV

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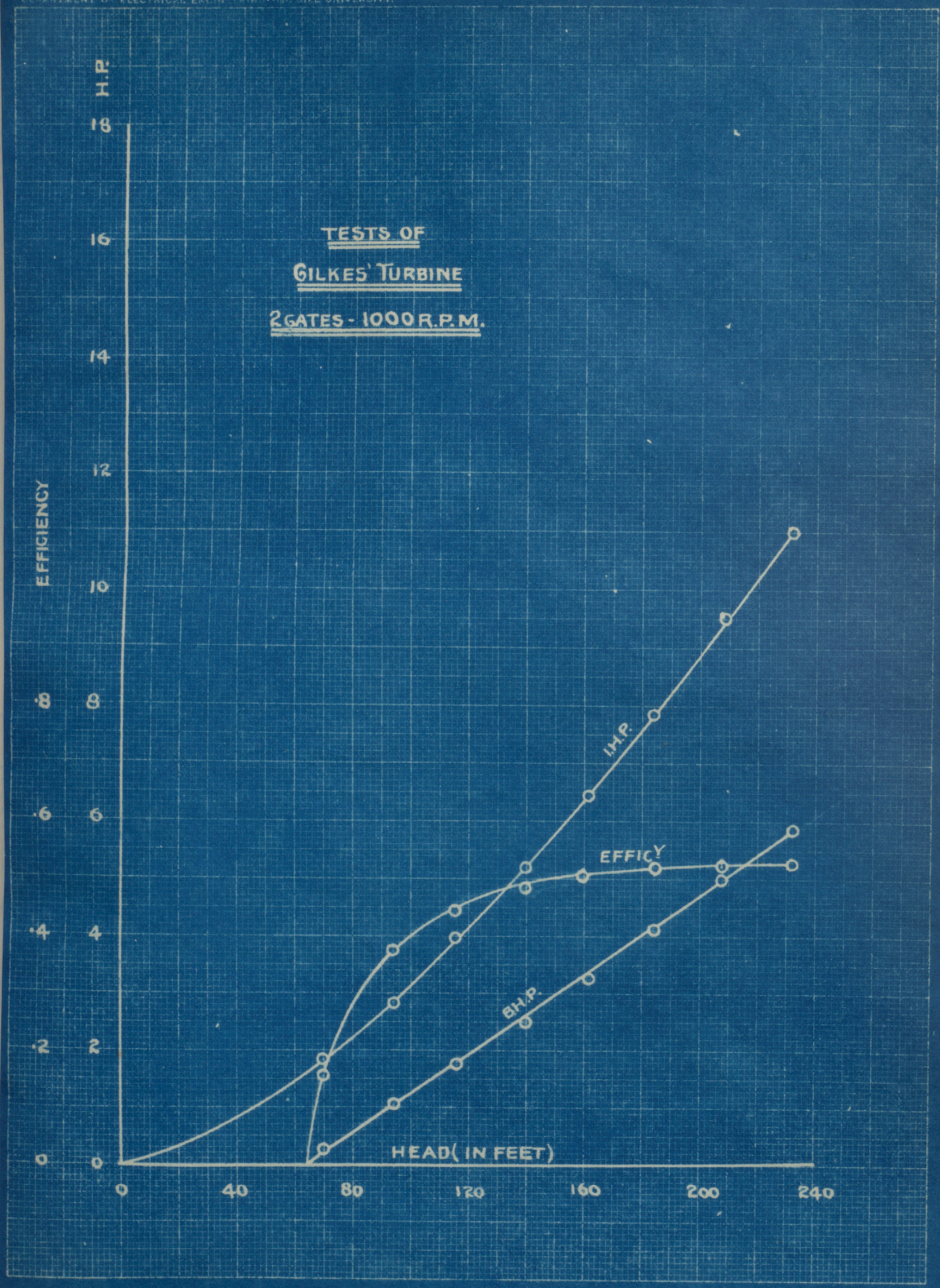
HYDRAULIC LABORATORY

Montreal,


TESTS OF
GILKES' TURBINE
2 GATES - 1000 R.P.M.
H.P.
EFFICIENCY
18
16
14
12
10
8
6
4
2
0
·8
·6
·4
·2
I.H.P.
EFFICY
B.H.P.
HEAD (IN FEET)
0
40
80
120
160
200
240

CURVES OF

EFFICIENCY, B.H.P. & I.H.P.

—— ON ——

SPEED (R. P. M.) BASE.

TWO GATES OPEN

CURVES OF

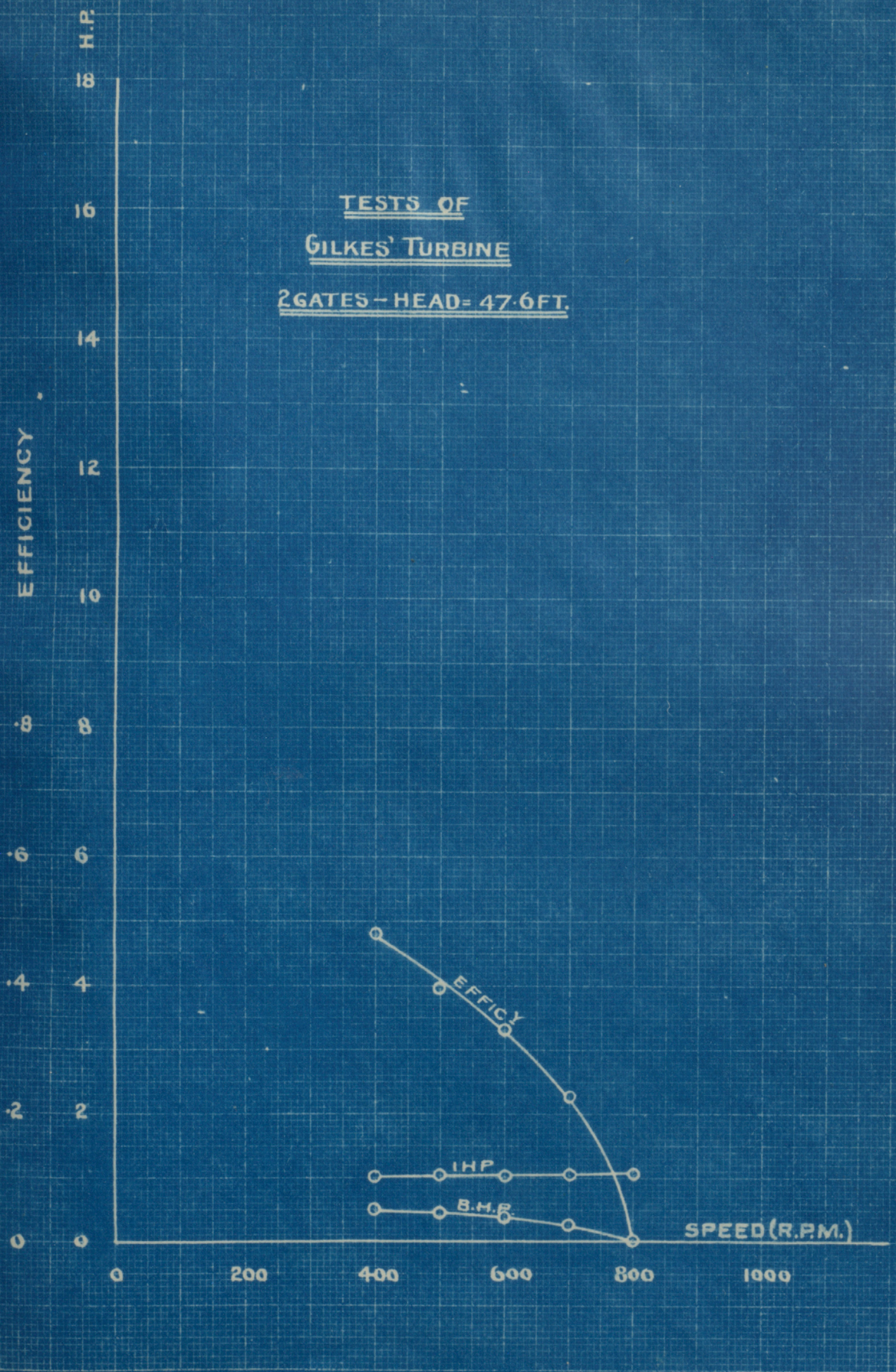
REFLEXIMETRY, B.M.P. & I.M.P.

ON

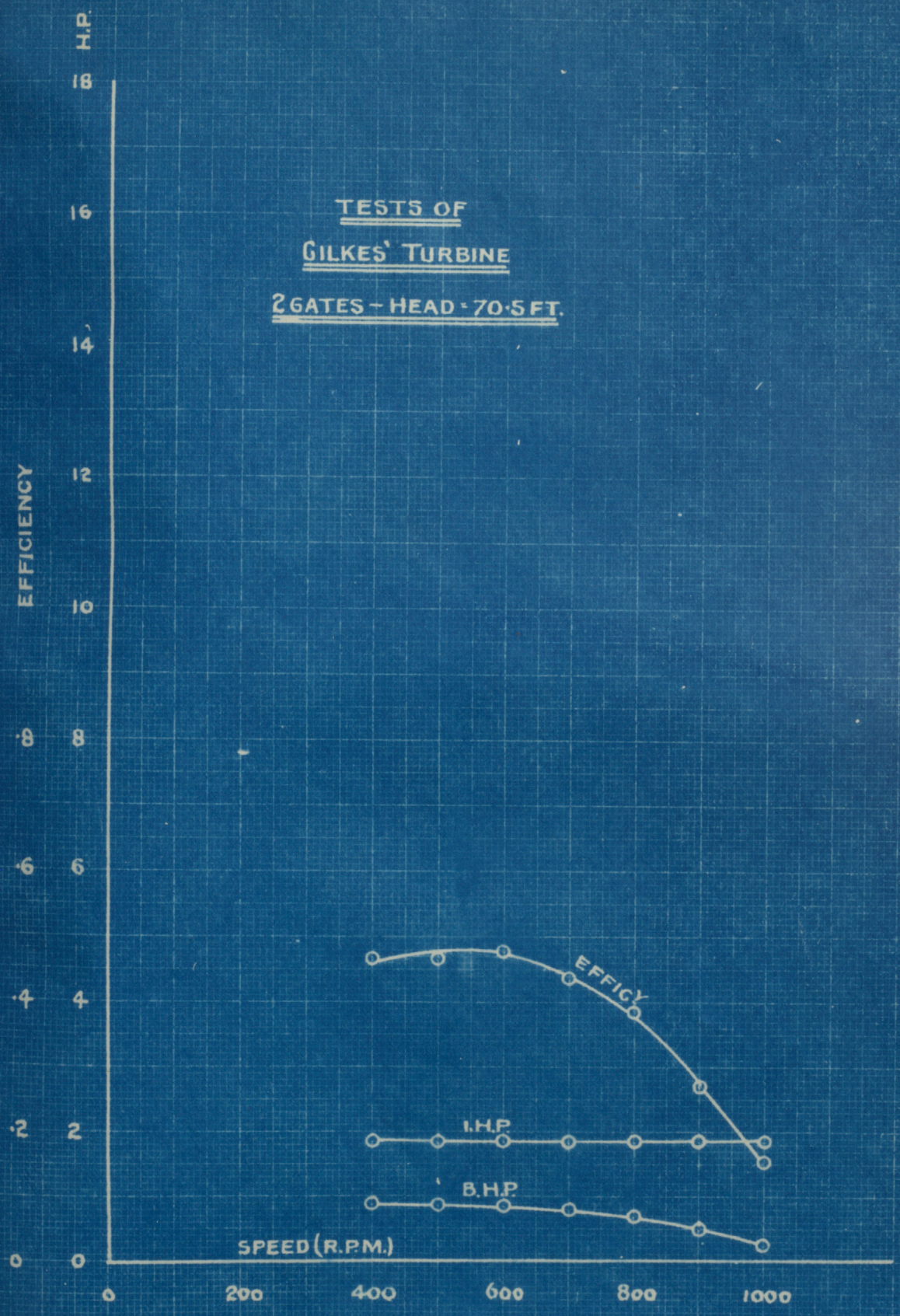
SPEED (R. P. M.) BASIS.

TWO GATES OPEN

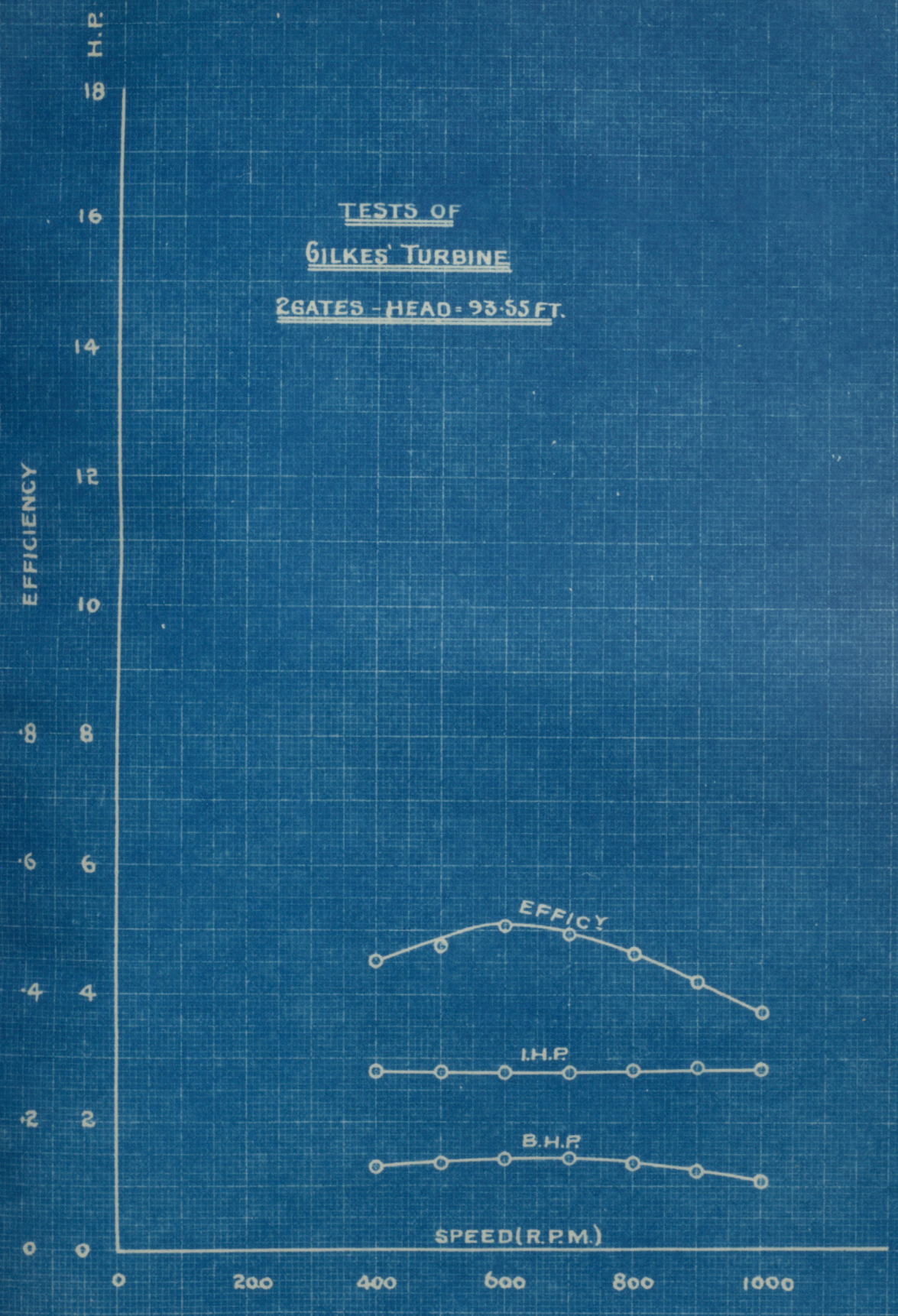
TESTS OF
GILKES' TURBINE
2 GATES – HEAD = 47·6 FT.



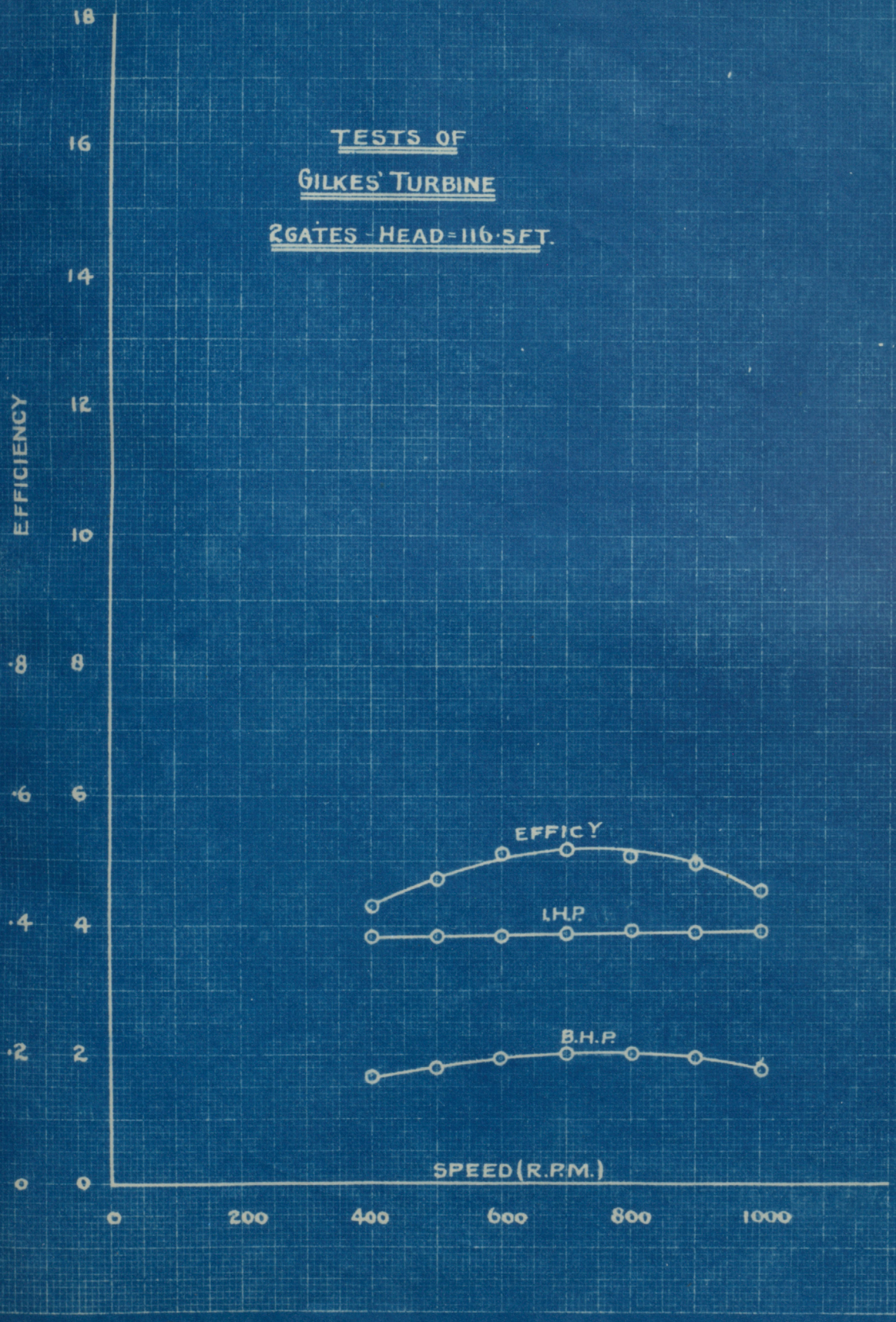
TESTS OF
GILKES' TURBINE
2 GATES – HEAD = 70·5 FT.



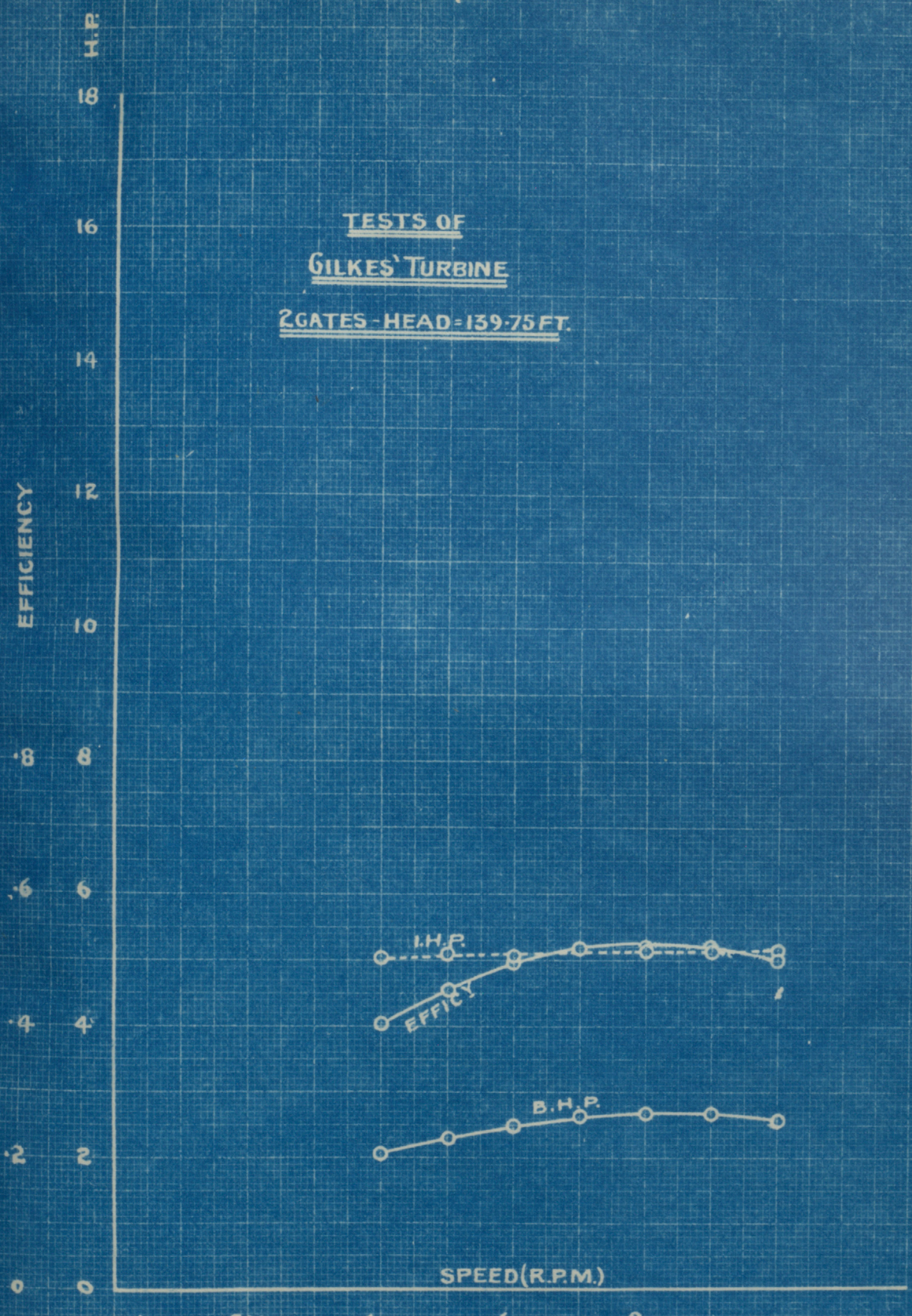
TESTS OF
GILKES' TURBINE
2 GATES - HEAD = 93·55 FT.

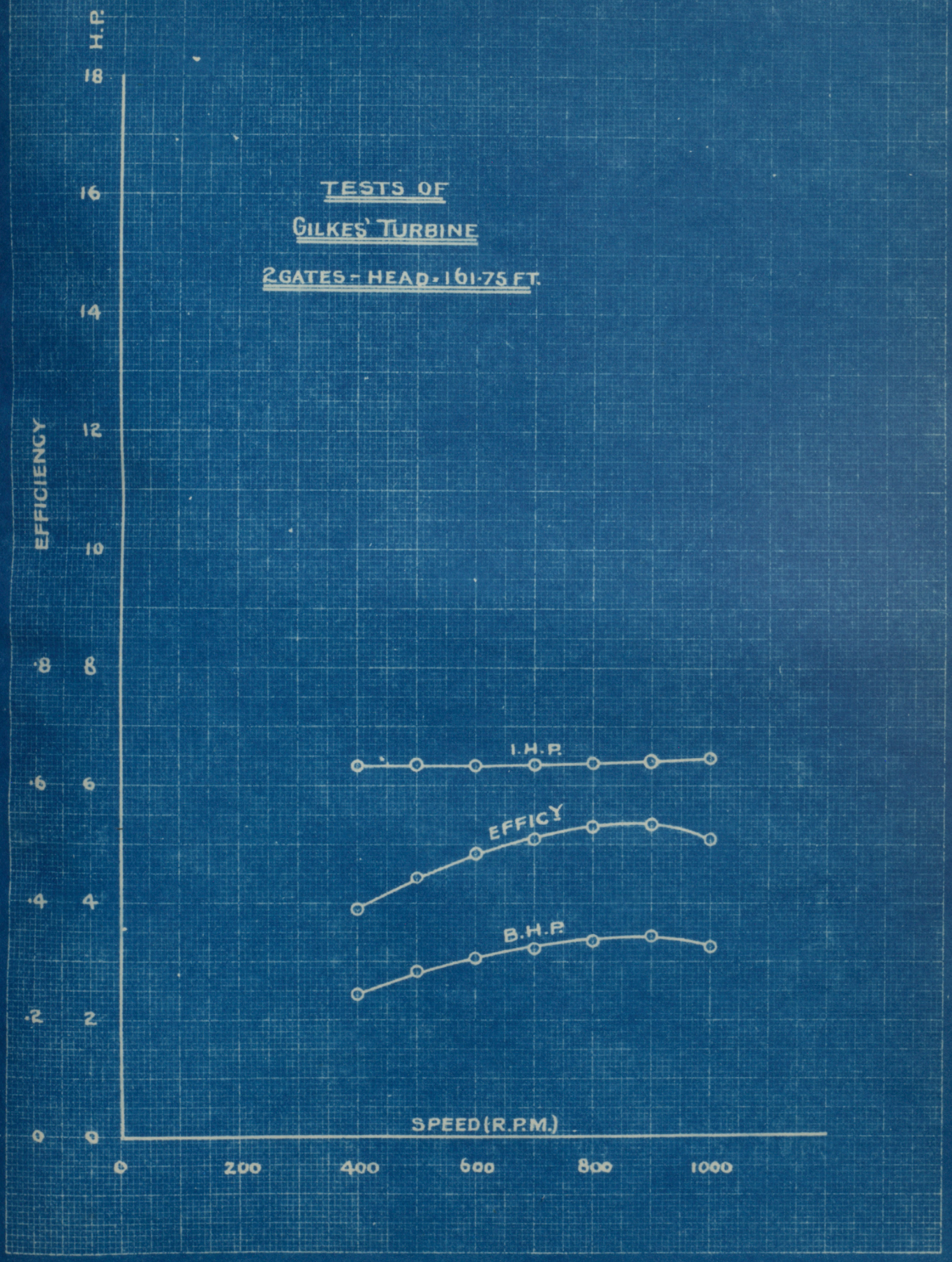


TESTS OF
GILKES' TURBINE
2 GATES - HEAD = 116·5 FT.



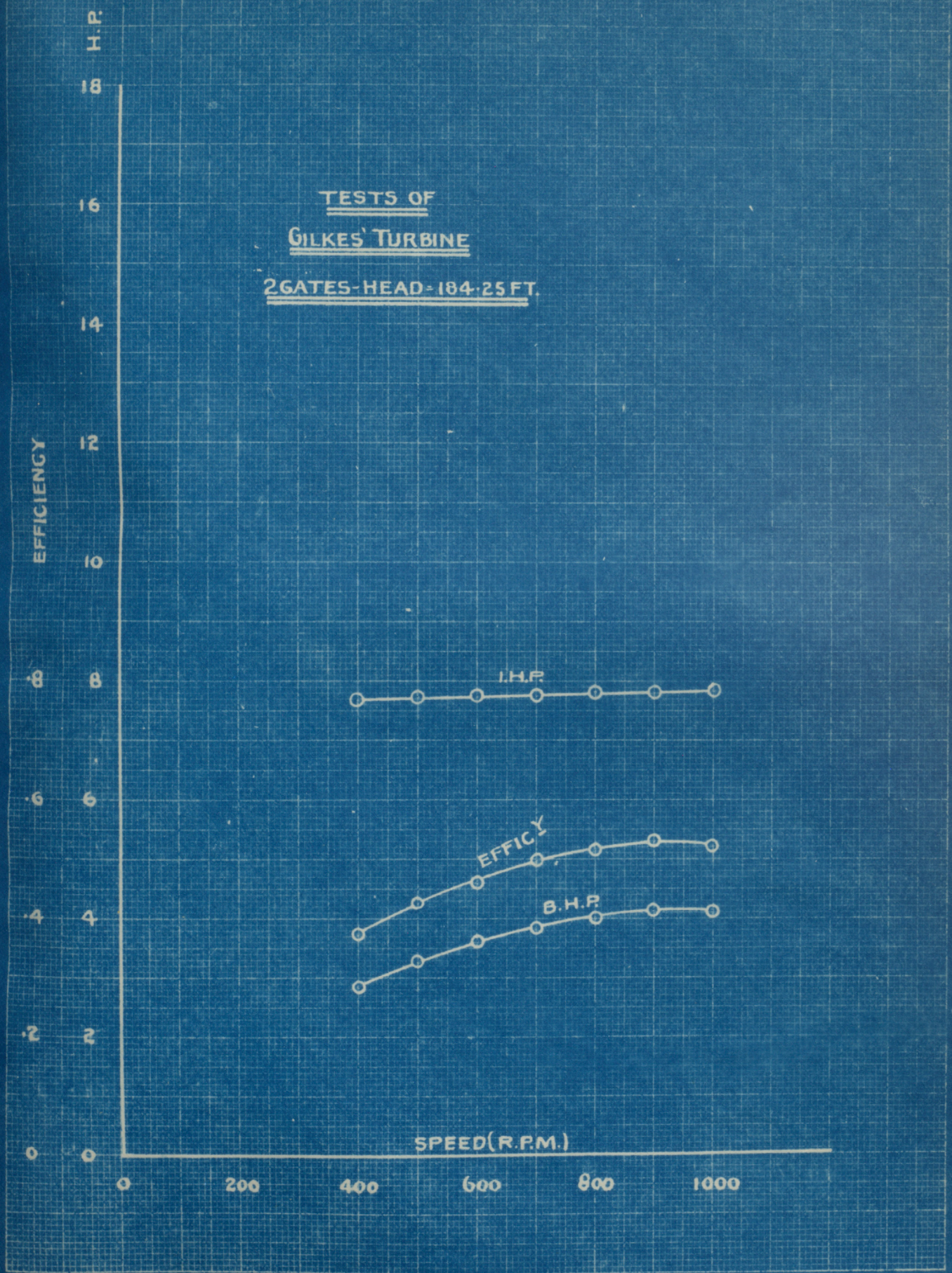
TESTS OF
GILKES' TURBINE
2 GATES - HEAD = 139·75 FT.




H.P.
18
16
14
12
10
8
6
4
2
0
EFFICIENCY
·8
·6
·4
·2
0
TESTS OF
GILKES' TURBINE
2 GATES - HEAD - 161·75 FT.
I.H.P.
EFFICY
B.H.P.
SPEED (R.P.M.)
0
200
400
600
800
1000

DEPARTMENT OF ELECTRICAL ENGINEERING--MC GILL UNIVERSITY.

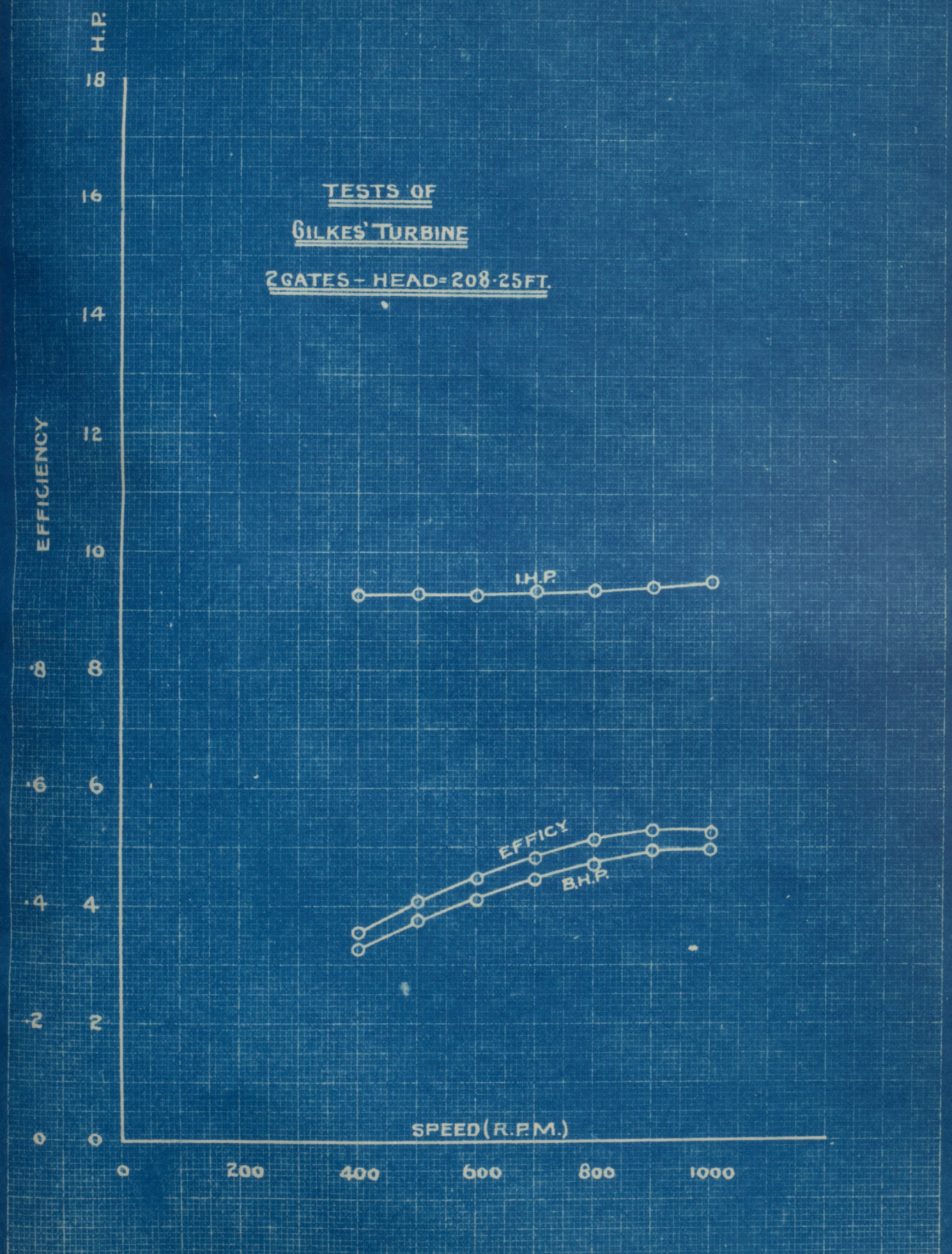
TESTS OF
GILKES' TURBINE
2 GATES - HEAD = 184·25 FT.



DEPARTMENT OF ELECTRICAL ENGINEERING—MC GILL UNIVERSITY.

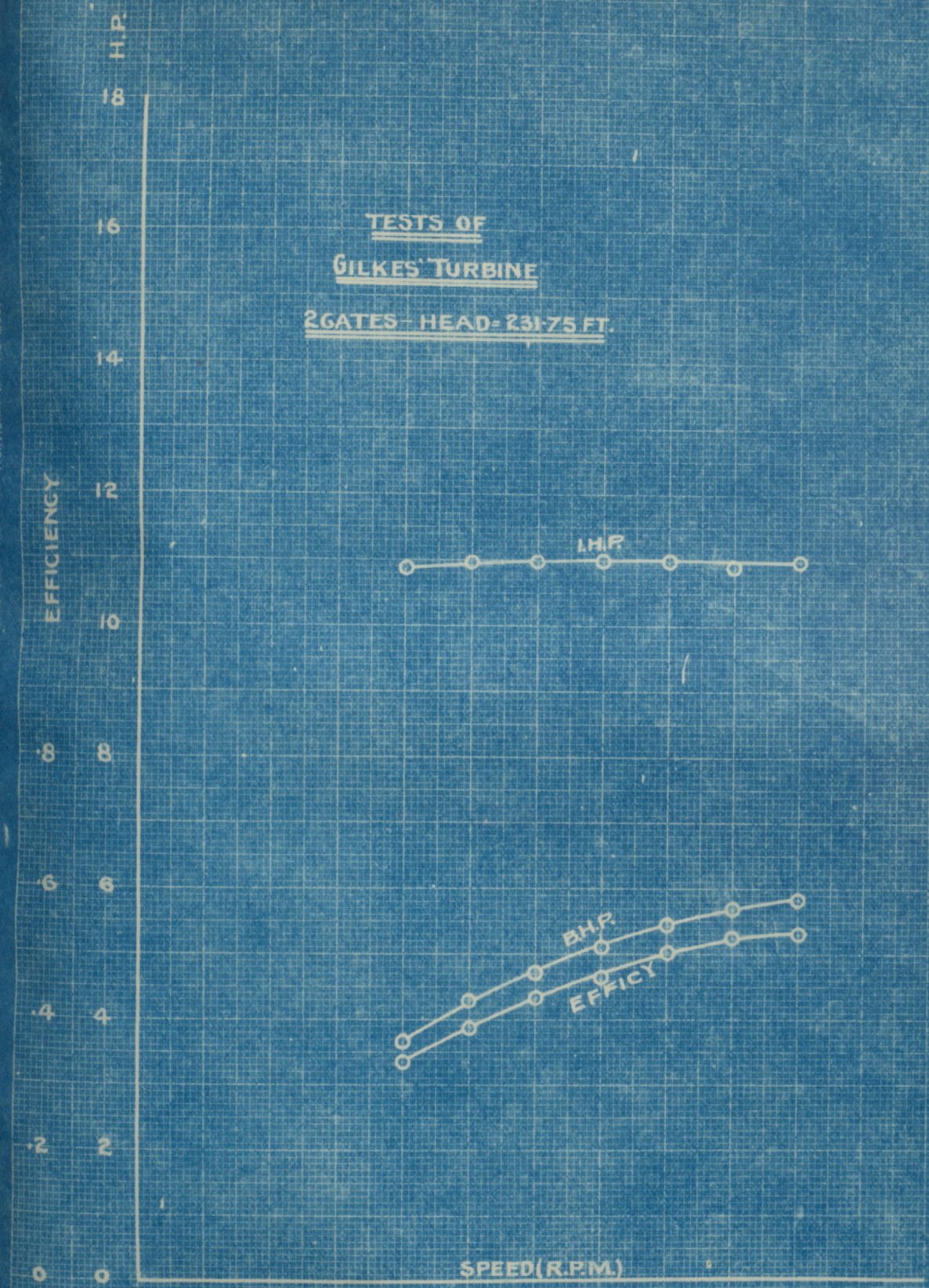
TESTS OF GILKES' TURBINE

2 GATES – HEAD = 208·25 FT.



DEPARTMENT OF ELECTRICAL ENGINEERING--MC GILL UNIVERSITY.

TESTS OF
GILKES' TURBINE
2 GATES - HEAD = 231·75 FT.



RESULT SHEETS OF

TRIALS ON THE TURBINE

—WITH—

ONE (1) GATE OPEN

RESULT SHEETS OF

TRIALS ON THE TURBINE

WITH

ONE (1) GATE OPEN

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Test of Gilkes Turbine — Montreal, January 29th 04

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
.16.30	Tank #2			1.5	30	0
.18.30	177			1.3	30	
.20.30				1.5	30	
.22.30	Tank #5			1.5	30	
.24.30	69.0				30	3185
	246					

Remarks:

Test No. 166

Average Pressure } 30 lbs./□"

Equivalent Head; Corrected } 70.5 ft.

Total time 480 secs.

$$\text{I. H. P.} = \frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$$

$$= .656$$

Average effective brake pull (T_1-T_2) } 1.45 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 398.1

$$\text{B.H.P.} = \frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$$

$$= .0839$$

$$\text{Efficiency} = \frac{\text{B.H.P.}}{\text{I. H. P.}} = 12.8\ \%$$

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
0.27	Tank #2			2.75	40	0
.29	132.2			3.25	40	
.31				3.0	40	
.33	Tank #5			3.0	40	
.35	156.4			—	40	3180
	288.6					

Remarks:

Test No. 167

Average Pressure } 40 lbs./□"

Equivalent Head; Corrected } 93.55 ft.

Total time 480 secs.

$$\text{I. H. P.} = \frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$$

$$= 1.024$$

Average effective brake pull (T_1-T_2) } 3.00 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 398

$$\text{B.H.P.} = \frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$$

$$= .1735$$

$$\text{Efficiency} = \frac{\text{B.H.P.}}{\text{I. H. P.}} = 16.93\ \%$$

McGILL UNIVERSITY.

HYDRAULIC LABORATORY.

st of Gilkes Turbine Montreal, January 29th 1904

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
·37	Tank #2			4·5	50	0
·39	136·8			4·3	50	
·41				4·6	50	
·43	Tank #5			4·6	50	
·45	182·8			—	50	3185

Test No. 168

Average Pressure } 50 lbs./□″

Equivalent Head; Corrected } 116·5 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 1·41

Average effective brake pull (T_1-T_2) } 4·5 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 398·1

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= ·2605

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 18·45 %

marks:

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
46·30	Tank #2			6·7	60	0
48·30	148·3			6·75	60	
50·30				6·7	60	
52·30	Tank #5			6·75	60	
54·30	210·3			—	60	3190
	358·6					

Test No. 169

Average Pressure } 60 lbs./□″

Equivalent Head; Corrected } 139·75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 1·9

Average effective brake pull (T_1-T_2) } 6·75 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 399

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= ·394

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 20·7 %

marks:

McGILL UNIVERSITY.

HYDRAULIC LABORATORY.

Montreal, Feb 1st 1904

est of Gilkes Turbine.

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
17.30	Tank #2			9.0	70	0
19.30	150.7			9.0	70	
21.30				9.0	70	
23.30	Tank #5			9.4	70	
25.30	221.8			—	70	3140
	372.5					

Test No. 170

Average Pressure } 70 lbs./□″

Equivalent Head; Corrected } 161.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$ = 2.28

Average effective brake pull (T_1-T_2) } 9.1 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 392.5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$ = .578

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 22.7 %

emarks:

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
29	Tank #2			11.25	80	0
31	156.4			11.25	80	
33				11.50	80	
35	Tank #5			11.50	80	
37	256.4			—	80	3206
	412.8					

Test No. 171

Average Pressure } 80 lbs./□″

Equivalent Head; Corrected } 184.25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$ = 2.88

Average effective brake pull (T_1-T_2) } 11.37 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 400.8

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$ = .662

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 23.0 %

marks:

McGILL UNIVERSITY.

HYDRAULIC LABORATORY.

Montreal, Feb 1st 1904

est of Gilkes Turbine.

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter No. of Rev'ns
38.30	Tank #2			13.75	90	0
40.30	161			13.50	90	
42.30				13.50	90	
44.30	Tank #5			13.50	90	
46.30	281.6			—	90	3200
	442.6					

Test No. 172

Average Pressure } 90 lbs./□″

Equivalent Head; Corrected } 208.25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 3.5

Average effective brake pull (T_1-T_2) } 13.6 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 400

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .791

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 22.6 %

emarks:

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter No. of Rev'ns
48.30	Tank #2			16.1	100	0
50.30	303.5			16.0	100	
52.30				16.0	100	
54.30	Tank #5			16.1	100	
56.30	164.5			—	100	3230
	468					

Test No. 173

Average Pressure } 100 lbs./□″

Equivalent Head; Corrected } 231.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 4.1

Average effective brake pull (T_1-T_2) } 16.05 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 404

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .942

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 23.0 %

marks:

End of Set No XV.

McGILL UNIVERSITY

HYDRAULIC LABORATORY.

Montreal, _____ 19____

Amount of Water Used (gallons)	BRAKE READINGS (lbs.)			Pressure by Gauge (lbs. □")	Counter No. of Revs.
	T_1	T_2	$T_1 - T_2$		

Test No. _____

Average Pressure _____ lbs.

Equivalent Head; Corrected _____ ft.

Total time _____ secs.

I.H.P. = $\frac{\text{Head} \times \text{pounds water used}}{\text{Time in secs.} \times 550}$

= _____

Average effective brake pull ($T_1 - T_2$) _____ lbs.

Effective diam'r of brake wheel _____ ft.

Average R.P.M. _____

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= _____

Efficiency = $\frac{\text{B.H.P.}}{\text{I.H.P.}}$ = _____

Amount of Water Used (gallons)	BRAKE READINGS (lbs.)			Pressure by Gauge (lbs. □")	Counter No. of Revs.
	T_1	T_2	$T_1 - T_2$		

Test No. _____

Average Pressure _____ lbs.

Equivalent Head; Corrected _____ ft.

Total time _____ secs.

I.H.P. = $\frac{\text{Head} \times \text{pounds water used}}{\text{Time in secs.} \times 550}$

= _____

Average effective brake pull ($T_1 - T_2$) _____ lbs.

Effective diam'r of brake wheel _____ ft.

Average R.P.M. _____

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= _____

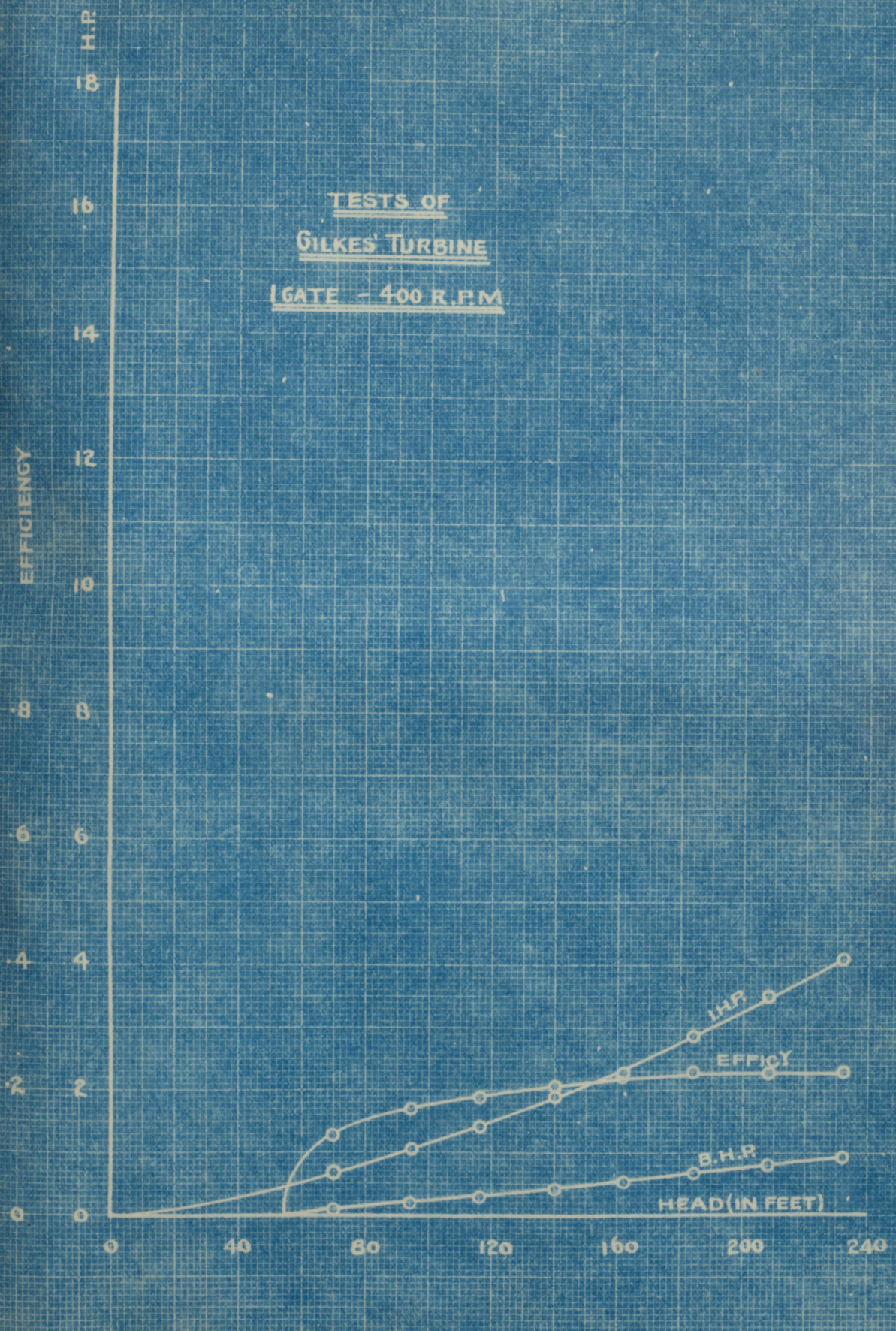
Efficiency = $\frac{\text{B.H.P.}}{\text{I.H.P.}}$ = _____

DEPARTMENT OF ELECTRICAL ENGINEERING--MC GILL UNIVERSITY.

THIS MARGIN RESERVED FOR BINDING. IF SHEET IS READ THE OTHER WAY (VERTICALLY), THIS MUST BE LEFT-HAND SIDE.

TESTS OF GILKES' TURBINE

GATE - 400 R.P.M.



McGILL UNIVERSITY.

HYDRAULIC LABORATORY.

Test of Silkes Turbine — Montreal, February 1st 1904

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
·59·30	Tank #2			2.1	40	0
·01·30	~~138·8~~			2.1	40	
·03·30	228·8			2.1	40	
·05·30	Tank #5			2.25	40	
·07·30	~~160·5~~			—	40	4090
	62·0					
	~~310·7~~					
	290·8					

Remarks:

Test No. 174

Average Pressure } 40 lbs./□″

Equivalent Head; Corrected } 93.55 ft.

Total time 480 secs.

I. H. P. = Head x pounds water used. / Time in secs. x 550.

= 1.03

Average effective brake pull (T_1-T_2) } 2.14 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 571

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .159

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 15.42 %

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
10·18	Tank #2			4.3	50	0
·20	150·2			4.3	50	
·22				4.3	50	
·24	Tank #5			4.3	50	
·26	160.5			—	50	4015
	310·7					

Remarks:

Test No. 175

Average Pressure } 50 lbs./□″

Equivalent Head; Corrected } 116.5 ft.

Total time 480 secs.

I. H. P. = Head x pounds water used. / Time in secs. x 550.

= 1.372

Average effective brake pull (T_1-T_2) } 4.3 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 502.0

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .314

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 22.85 %

McGILL UNIVERSITY.

HYDRAULIC LABORATORY.

Test of Gilkes 4 Turbine Montreal, Feb. 1st 1904

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
29.30	Tank #2			6.5	60	0
31.30	154			6.0	60	
33.30				5.75	60	
35.30	Tank #5			5.8	60	
37.30	199			—	60	4020
	353					

Remarks:

Test No. 176

Average Pressure } 60 lbs./□″

Equivalent Head; Corrected } 139.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 1.87

Average effective brake pull (T_1-T_2) } 6.01 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 502.2

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .4385

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 23.5 %

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
10.39	Tank #2			7.8	70	0
.41	186			7.6	70	
.43				7.8	70	
.45	Tank #5			7.8	70	
.47	242.8			-	70	4005
	380					

Remarks:

Test No. 177

Average Pressure } 70 lbs./□″

Equivalent Head; Corrected } 161.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 2.328

Average effective brake pull (T_1-T_2) } 7.75 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 500.6

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .563

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 24.2 %

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HYDRAULIC LABORATORY.

Montreal, Feb 1st 1904

est of Likes Turbine.

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
·49·30	Tank #2			9·9	80	0
·51·30	165·5			9·75	80	
·53·30				9·75	80	
·55·30	Tank #5			9·75	80	
·57·30	246·			—	80	4040
	411·5					

Test No. 178

Average Pressure } 80 lbs./□″

Equivalent Head; Corrected } 184·25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 2·875

Average effective brake pull (T_1-T_2) } 9·8 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 505

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= ·722

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 25·1 %

emarks:

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
1·00	Tank #2			11·75	90	0
·02.	304·6			11·75	90	
·04				11·80	90	
·06	Tank #5			12·00	90	
·08	137·5			—	90	4050
	442·1					

Test No. 179

Average Pressure } 90 lbs./□″

Equivalent Head; Corrected } 208·25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 3·495

Average effective brake pull (T_1-T_2) } 11·82 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 506

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= ·88

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 25·3 %

marks:

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Montreal, Feb 1st 1904

st of Gilkes Turbine

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
19	Tank #2			14.5	100	0
21	258.5			14.5	100	
23				14.5	100	
25	Tank #5			14.5	100	
27	220.6			—	100	4056
	479.1					

Test No. 180

Average Pressure } 100 lbs./□″

Equivalent Head; Corrected } 231.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 84.2

Average effective brake pull (T_1-T_2) } 14.5 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 507

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= 1.069

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 25.5 %

emarks:

End of Set No XVI

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns

Test No.

Average Pressure } lbs./□″

Equivalent Head; Corrected } ft.

Total time secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

=

Average effective brake pull (T_1-T_2) } lbs.

Effective diam'r of brake wheel } ft.

Average R. P. M.

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

=

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = %

emarks:

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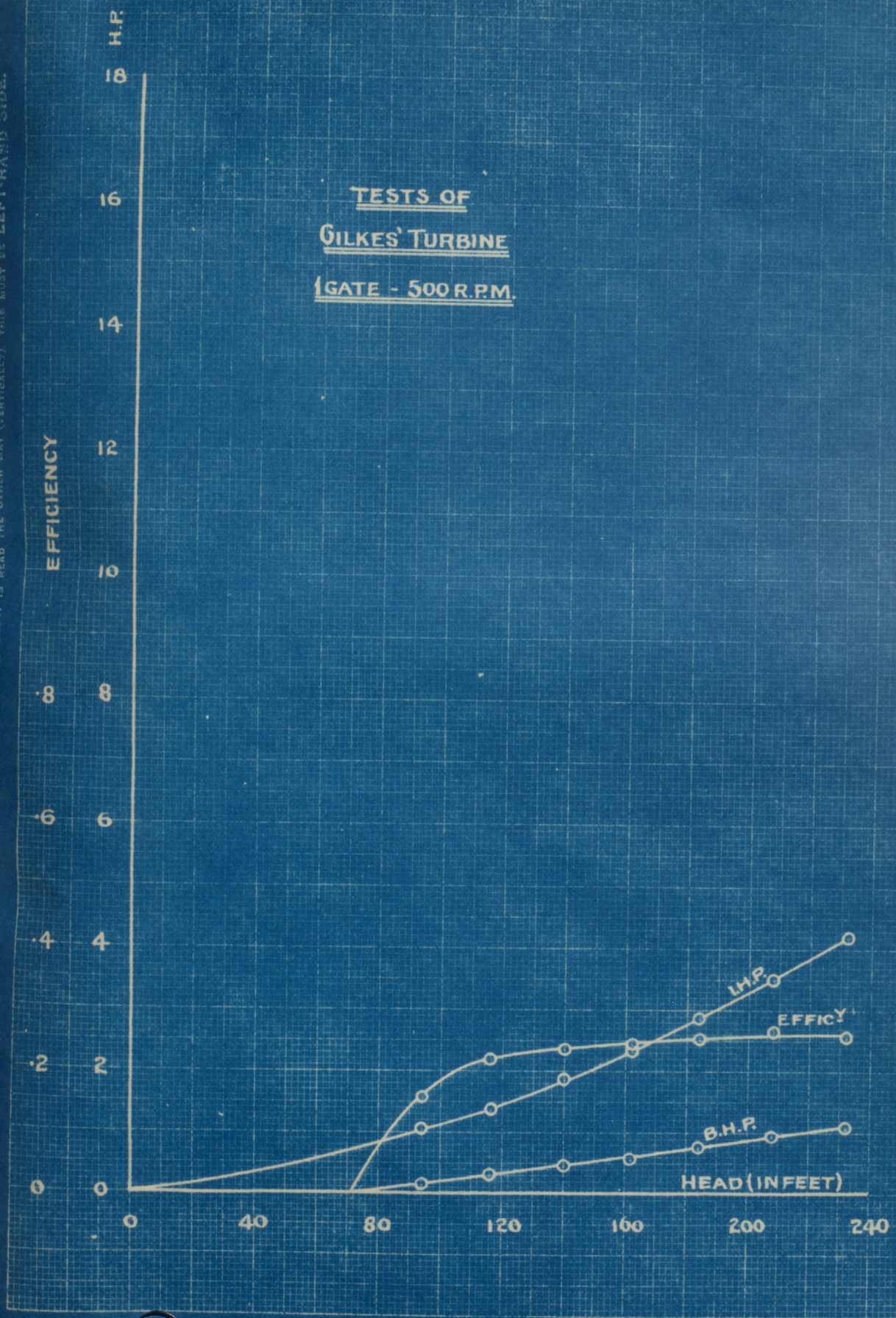
THIS MARGIN RESERVED FOR BINDING. IF SHEET IS READ THE OTHER WAY (VERTICALLY) THIS MUST BE LEFT-HAND SIDE.

TESTS OF GILKES' TURBINE

1 GATE - 500 R.P.M.



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st of Gilkes Turbine Montreal, Feb 4th 1904

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
15·30	Tank #2			2.5	50	0
17·30	140·3			2.4	50	
19·30				2.6	50	
21·30	Tank #5			2.6	50	
23·30	164·3			—	50	4790
	304.6					

emarks:

Test No. 181

Average Pressure } 50 lbs./□"

Equivalent Head; Corrected } 116.5 ft.

Total time 480 secs.

I. H. P. = Head x pounds water used. / Time in secs. x 550.

= 1·345

Average effective brake pull (T_1-T_2) } 2.52 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 599

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= ·2196

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 16·32 %

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
9·27·30	Tank #2			4.0	60	0
29.30	147.2			3.75	60	
31.30				3.9	60	
33·30	Tank #5			3.9	60	
35.30	196.6			—	60	4816
	343.8					

marks:

Test No. 182

Average Pressure } 60 lbs./□"

Equivalent Head; Corrected } 139.75 ft.

Total time 480 secs.

I. H. P. = Head x pounds water used. / Time in secs. x 550.

= 1.822

Average effective brake pull (T_1-T_2) } 3.9 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 602

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= ·35

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 19.2 %

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Montreal,

of

Amount of Water Used (gallons)	T1	T2	T1-T2	Pressure by Gauge (lbs. / □")	Counter No. of Revns.
Rank #2	8.5	3.6		0	
153.0	6.4	3.0			
Rank #3	8.6	3.0			
220.8	2.6	3.0			
	—	3.0			
373.0					

Remarks:

Amount of Water Used (gallons)	T1	T2	T1-T2	Pressure by Gauge (lbs. / □")	Counter No. of Revns.
Rank #2	4.0	6.0		0	
264	3.25	6.0			
Rank #3	3.7	6.0			
132.2	3.9	6.0			
	—	6.0			
401					

Remarks:

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HYDRAULIC LABORATORY.

Montreal, Feb 4th 1904

est of Silkes turbine

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
2·38	Tank #2			5.5	70	0
·40	153.1			5.6	70	
·42				5.4	70	
·44	Tank #5			5.6	70	
·46	220.8				70	4845
	373.9					

Test No. 183

Average Pressure } 70 lbs./□"

Equivalent Head; Corrected } 161.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 2.29

Average effective brake pull (T_1-T_2) } 5.52 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 605.6

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .486

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 21.2 %

emarks:

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
48·30	Tank #2			7.2	80	0
50·30	269			7.2	80	
52·30				7.2	80	
54·30	Tank #5			7.2	80	
56·30	132.2			—	80	4880
	401.2					

Test No. 184

Average Pressure } 80 lbs./□"

Equivalent Head; Corrected } 184.25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 2.8

Average effective brake pull (T_1-T_2) } 7.2 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 610

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .639

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 22.8 %

emarks:

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Montreal,

Test No.

Time	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	$T_1 - T_2$	Pressure by Gauge (lbs. / □")	Counter No. of Revns

Average Pressure

Equivalent Head; Corrected

Total time

I. H. P. = $\frac{\text{Head} \times \text{pounds water used.}}{\text{Time in secs.} \times 550.}$

=

Average effective brake pull $(T_1 - T_2)$

Effective diam'r of brake wheel

Average R. P. M.

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

=

Efficiency = $\frac{\text{B.H.P.}}{\text{I.H.P.}}$ =

Remarks:

Test No.

Time	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	$T_1 - T_2$	Pressure by Gauge (lbs. / □")	Counter No. of Revns

Average Pressure

Equivalent Head; Corrected

Total time

I. H. P. = $\frac{\text{Head} \times \text{pounds water used.}}{\text{Time in secs.} \times 550.}$

=

Average effective brake pull $(T_1 - T_2)$

Effective diam'r of brake wheel

Average R. P. M.

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

=

Efficiency = $\frac{\text{B.H.P.}}{\text{I.H.P.}}$ =

Remarks:

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HYDRAULIC LABORATORY.

Montreal, Feb 4th 1904

Test of Gilkes Turbine

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
0.00	Tank #2			9.2	90	0
.02	280.5			9.3	90	
.04				9.5	90	
.06	Tank #5			9.5	90	
.08	142.6			—	90	4816
	423.1					

Remarks:

Test No. 185

Average Pressure } 90 lbs./□″

Equivalent Head; Corrected } 208.25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 3.345

Average effective brake pull (T_1-T_2) } 9.4 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 602

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .822

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 24.6 %

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
10.18	Tank #2			11.0	100	0
.20	279			11.2	100	
.22				11.3	100	
.24	Tank #5			11.2	100	
.26	156			—	100	4840
	435					

Remarks:

Test No. 186

Average Pressure } 100 lbs./□″

Equivalent Head; Corrected } 231.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= ~~4.18~~ 3.8

Average effective brake pull (T_1-T_2) } 11.18 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 605

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .985

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 26.0 %

End of Set No XVII

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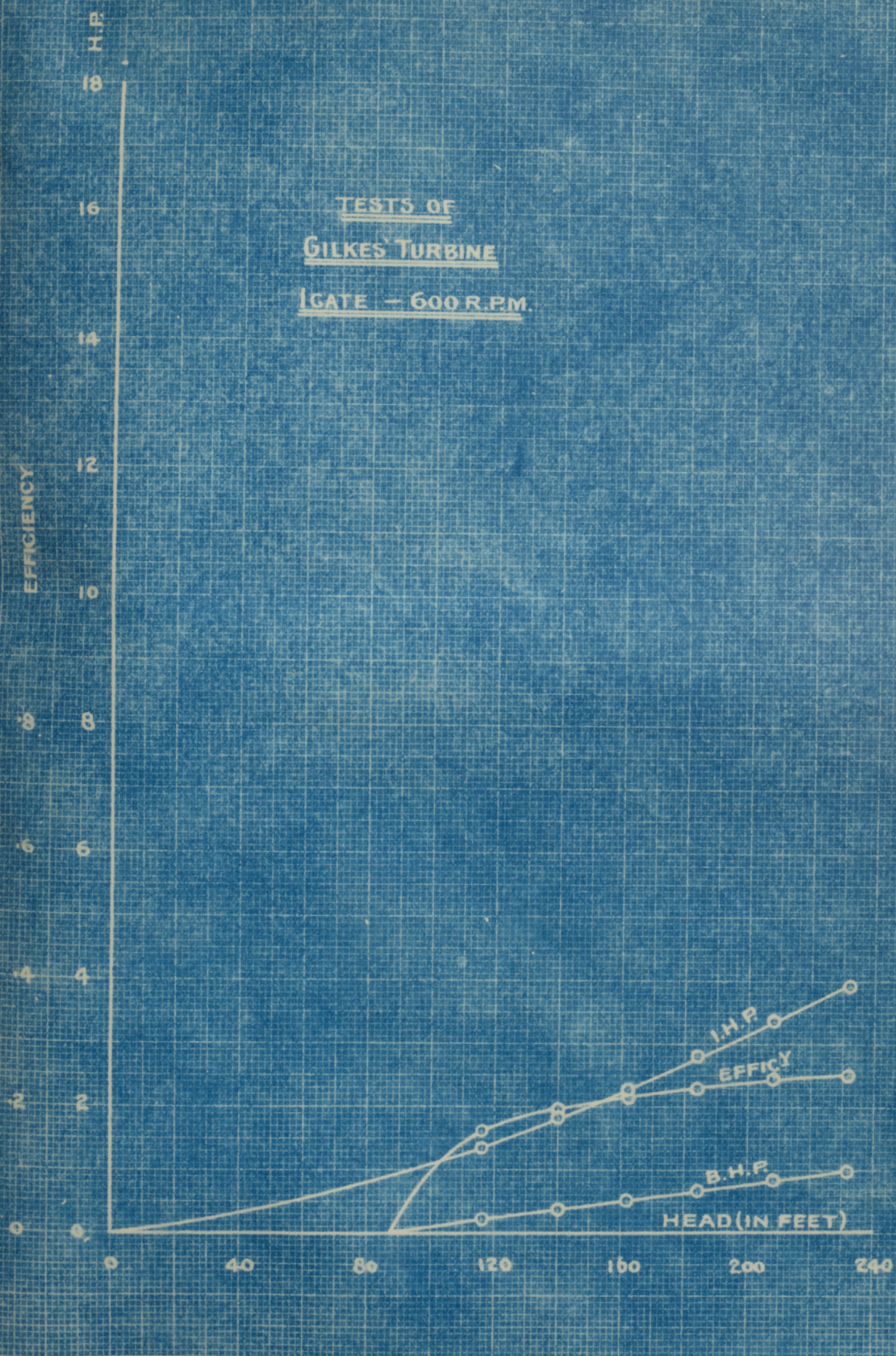
THIS MARGIN RESERVED FOR BINDING.

IF SHEET IS READ THIS WAY (HORIZONTALLY), THIS MUST BE LEFT-HAND SIDE.
IF SHEET IS READ THE OTHER WAY (VERTICALLY), THIS MUST BE LEFT-HAND SIDE.

TESTS OF GILKES TURBINE

GATE – 600 R.P.M.



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est of Gilkes Turbine Montreal, Feb 5th 1904

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
1·09	Tank #2			3·0	60	0
·11	200			3·0	60	
·13				2·7	60	
·15	Tank #5			2·9	60	
·17	132			—	60	5600
	332					

Test No. 187

Average Pressure } 60 lbs./□″

Equivalent Head; Corrected } 139·75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 1·757

Average effective brake pull (T_1-T_2) } 2·9 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 700

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= ·295

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 16·8 %

emarks:

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
11·20·30	Tank #2			4·5	70	0
·22·30	210·3			4·5	70	
·24·30				4·5	70	
·26·30	Tank #5			4·4	70	
·28·30	160·0			—	70	5580
	370·3					

Test No. 188

Average Pressure } 70 lbs./□″

Equivalent Head; Corrected } 161·75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 2·27

Average effective brake pull (T_1-T_2) } 4·48 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 697·5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= ·455

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 20·0 %

emarks:

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HYDRAULIC LABORATORY.

Montreal, Feb 5th 1904

Test of Filkes Turbine.

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
1.31.30	Tank #2			6.0	80	0
.33.30	224.1			6.0	80	
.35.30				6.1	80	
.37.30	Tank #5			6.0	80	
.39.30	177			—	80	5596
	401.1					

Test No. 189

Average Pressure } 80 lbs./□″

Equivalent Head; Corrected } 184.25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 2.795

Average effective brake pull (T_1-T_2) } 6.02 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 699.5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .612

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 21.9 %

Remarks:

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
11.42	Tank #2			7.6	90	0
.44	170			7.8	90	
.46				7.7	90	
.48	Tank #5			7.9	90	
.50	251.7			—	90	5595
	421.7					

Test No. 190

Average Pressure } 90 lbs./□″

Equivalent Head; Corrected } 208.25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 3.335

Average effective brake pull (T_1-T_2) } 7.75 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 699.4

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .786

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 23.6 %

Remarks:

of 5

Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	$T_1 - T_2$	Pressure by Gauge (lbs. / □")	Counter No. of Revns

Remarks:

Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	$T_1 - T_2$	Pressure by Gauge (lbs. / □")	Counter No. of Revns

Remarks:

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HYDRAULIC LABORATORY.

Montreal, Feb 5th 1904

est of Gilkes Turbine

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
11.52.30	Tank #2			9.5	100	0
.54.30	171.2			9.5	100	
.56.30				9.5	100	
.58.30	Tank #5			9.9	100	
12.00.30	273.5			—	100	5595
	444.7					

Test No. 191

Average Pressure } 100 lbs./□″

Equivalent Head; Corrected } 231.75 ft.

Total time 480 secs.

I. H. P. = Head x pounds water used. / Time in secs. x 550.

= 3.9

Average effective brake pull (T_1-T_2) } 9.6 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 699.4

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .975

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 24.95 %

emarks:

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
12.10	Tank #2			1.0	50	0
.12	150.5			.9	50	
.14				1.1	50	
.16	Tank #5			1.0	50	
.18	157.5			—	50	5585
	308					

Test No. 192

Average Pressure } 50 lbs./□″

Equivalent Head; Corrected } 116.5 ft.

Total time 480 secs.

I. H. P. = Head x pounds water used. / Time in secs. x 550.

= 1.36

Average effective brake pull (T_1-T_2) } 1.0 lbs.

Effective diam'r of brake wheel } 1.524 ft.

Average R. P. M. 698

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .101

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 7.35 %

emarks:

End of Set No. XVIII

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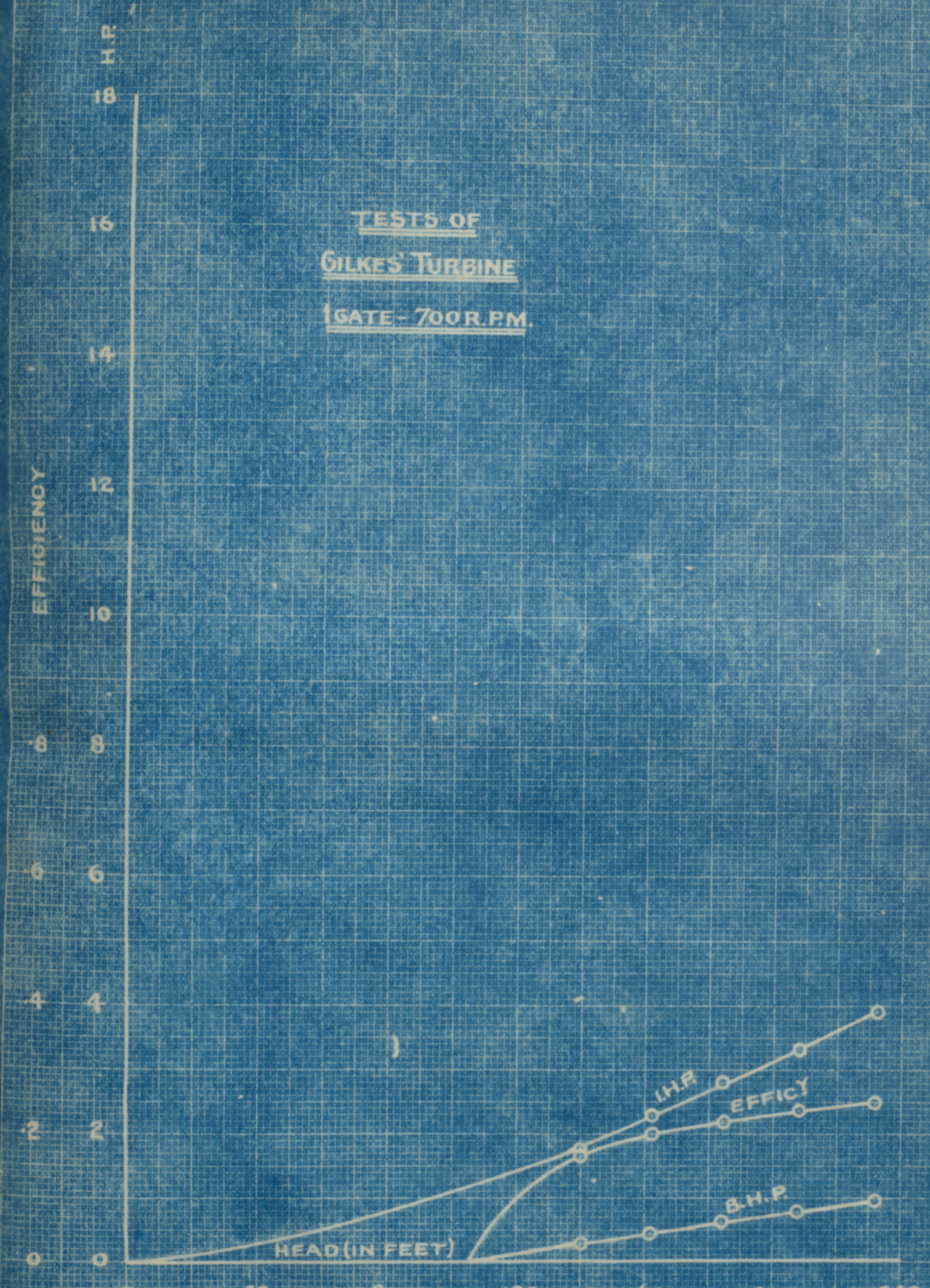
THIS MARGIN RESERVED FOR BINDING.

TESTS OF GILKES' TURBINE

1 GATE - 700 R.P.M.



McGILL UNIVERSITY.

HYDRAULIC LABORATORY.

Montreal, Feb 5th 1904

Test of Silkes Turbine

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter No. of Rev'ns
12.23	Jauk #2			1.80	60	0
.25	155.2			1.0	60	
.27				1.0	60	
.29	Jauk #5			1.0	60	
.31	186.2			—	60	6465
	341.4					

Remarks:

Test No. 193

Average Pressure } 60 lbs./□″

Equivalent Head; Corrected } 139.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 1.806

Average effective brake pull (T_1-T_2) } 1.0 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 808

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .117

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 6.6 %

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter No. of Rev'ns
12.37	Jauk #2			2.75	70	0
.39	164.3			2.75	70	
.41				2.75	70	
.43	Jauk #5			2.75	70	
.45	210.3			—	70	6350
	374.6					

Remarks:

Test No. 194

Average Pressure } 70 lbs./□″

Equivalent Head; Corrected } 161.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 2.295

Average effective brake pull (T_1-T_2) } 2.75 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 794

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .317

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 13.8 %

McGILL UNIVERSITY.

HYDRAULIC LABORATORY.

Test of Silkes Turbine — Montreal, Feb 5th 1904

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
12.48	Tank #2			4.6	80	0
.50	164.8			4.7	80	
.52				4.6	80	
.54	Tank #5			4.6	80	
.56	236			—	80	6440
	400.8					

Remarks:

Test No. 195

Average Pressure } 80 lbs./□″

Equivalent Head; Corrected } 184.28 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 2.795

Average effective brake pull (T_1-T_2) } 4.62 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 805

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .541

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 19.35 %

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
2.04.30	Tank #2			6.3	90	0
.06.30	248.3			6.35	90	
.08.30				6.3	90	
.10.30	Tank #5			6.5	90	
.12.30	169			—	90	6424
	417.3					

Remarks:

Test No. 196

Average Pressure } 90 lbs./□″

Equivalent Head; Corrected } 208.25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 3.3

Average effective brake pull (T_1-T_2) } 6.41 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 803

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .746

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 22.6 %

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HYDRAULIC LABORATORY.

Montreal, Feb 5th 1904

est of Gilkes Turbine

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
2.14.30	Tank #2			8.1	100	0
16.30	278			8.3	100	
18.30				8.2	100	
20.30	Tank #5			8.2	100	
22.30	168			—	100	6460
	446					

Test No. 197

Average Pressure } 100 lbs./□″

Equivalent Head; Corrected } 231.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 3.91

Average effective brake pull (T_1-T_2) } 8.2 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 807.5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .963

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 24.6 %

emarks:

End of Set No. XIX.

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns

Test No.

Average Pressure } lbs./□″

Equivalent Head; Corrected } ft.

Total time secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

=

Average effective brake pull (T_1-T_2) } lbs.

Effective diam'r of brake wheel } ft.

Average R. P. M.

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

=

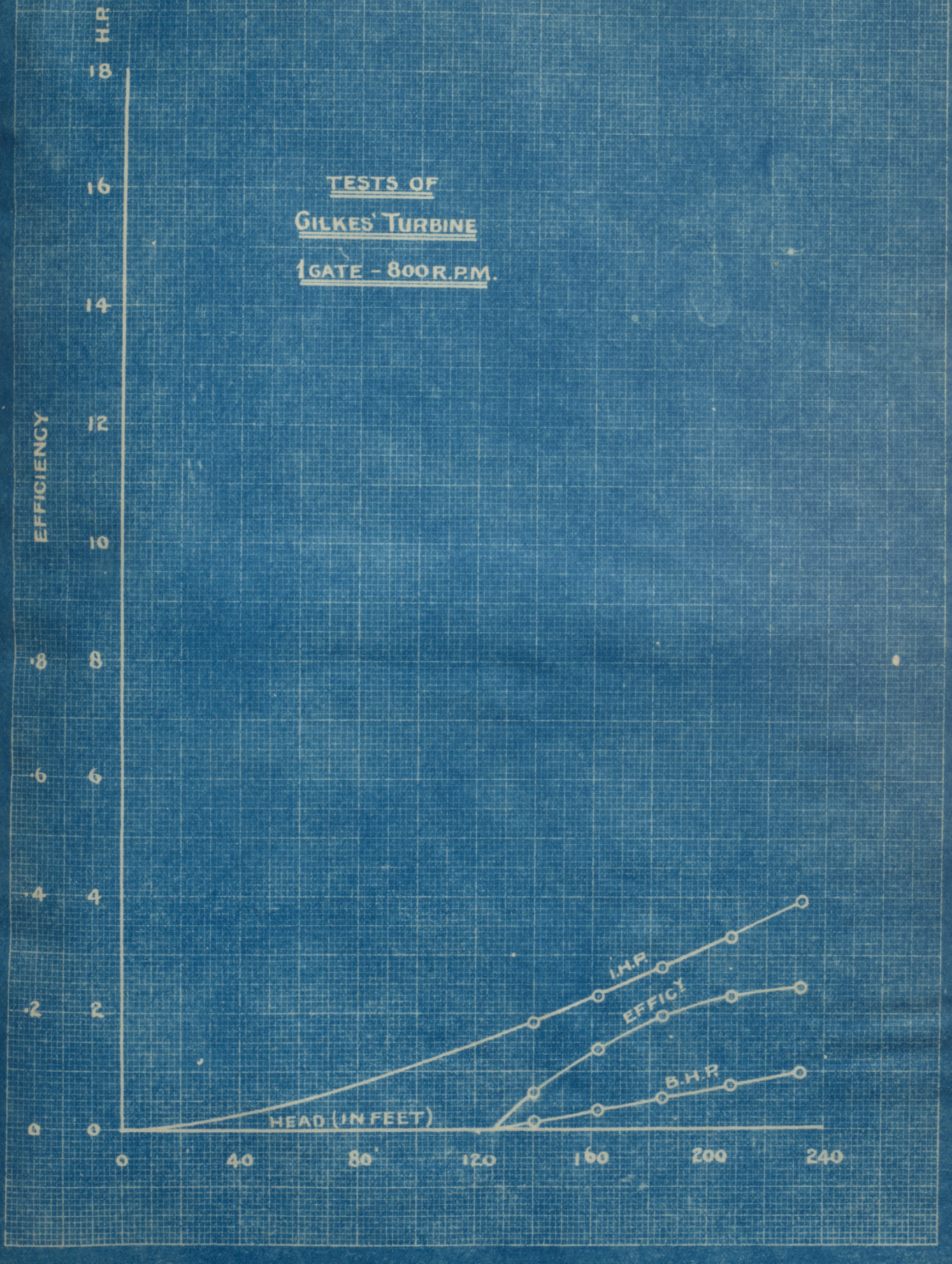
Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = %

emarks:

DEPARTMENT OF ELECTRICAL ENGINEERING - MC GILL UNIVERSITY.

THIS MARGIN RESERVED FOR BINDING.
IF SHEET IS READ THIS WAY (HORIZONTALLY), THIS MUST BE TOP.
IF SHEET IS READ THE OTHER WAY (VERTICALLY), THIS MUST BE LEFT-HAND SIDE.

TESTS OF
GILKES' TURBINE
1 GATE - 800 R.P.M.



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Montreal, Feb 6th 1904

est of Gilkes Turbine.

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
2·26	Tank #2			1·75	70	0
·28	178·1			1·85	70	
·30				1·8	70	
·32	Tank #5			1·9	70	
·34	193·2			—	70	7130
	371·4					

Test No. 198

Average Pressure } 70 lbs./□″

Equivalent Head; Corrected } 161·75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 2·276

Average effective brake pull (T_1-T_2) } 1·825 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 891

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= ·2369

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 10·41 %

emarks:

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
2·36	Tank #2			3·75	80	0
·38	156·5			3·8	80	
·40				3·75	80	
·42	Tank #5			3·6	80	
·44	239·1			—	80	7110
	395·6					

Test No. 199

Average Pressure } 80 lbs./□″

Equivalent Head; Corrected } 184·25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 3·35

Average effective brake pull (T_1-T_2) } 3·72 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 889

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= ·481

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 17·45 %

emarks:

McGILL UNIVERSITY.

HYDRAULIC LABORATORY.

Montreal, Feb 6th 1904

est of Gilkes Turbine

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
2·46	Tank #2			5·8	90	0
·48	128·7			5·6	90	
·50				5·8	90	
·52	Tank #5			5·8	90	
·54	296			–	90	7156
	424·7					

Test No. 200

Average Pressure } 90 lbs./□″

Equivalent Head; Corrected } 208·25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 3.35

Average effective brake pull (T_1-T_2) } 5·72 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 894·5

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= ·746

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 22·3 %

Remarks:

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
33·30	Tank #2			7·2	100	0
35·30	409·2			7·2	100	
37·30				7·4	100	
39·30	Tank #5			7·4	100	
41·30	31			–	100	7200
	440·2					

Test No. 201

Average Pressure } 100 lbs./□″

Equivalent Head; Corrected } 231·75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 3.87

Average effective brake pull (T_1-T_2) } 7·3 lbs.

Effective diam'r of brake wheel } 1·528 ft.

Average R. P. M. 900

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= ·956

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 24·7 %

Remarks:

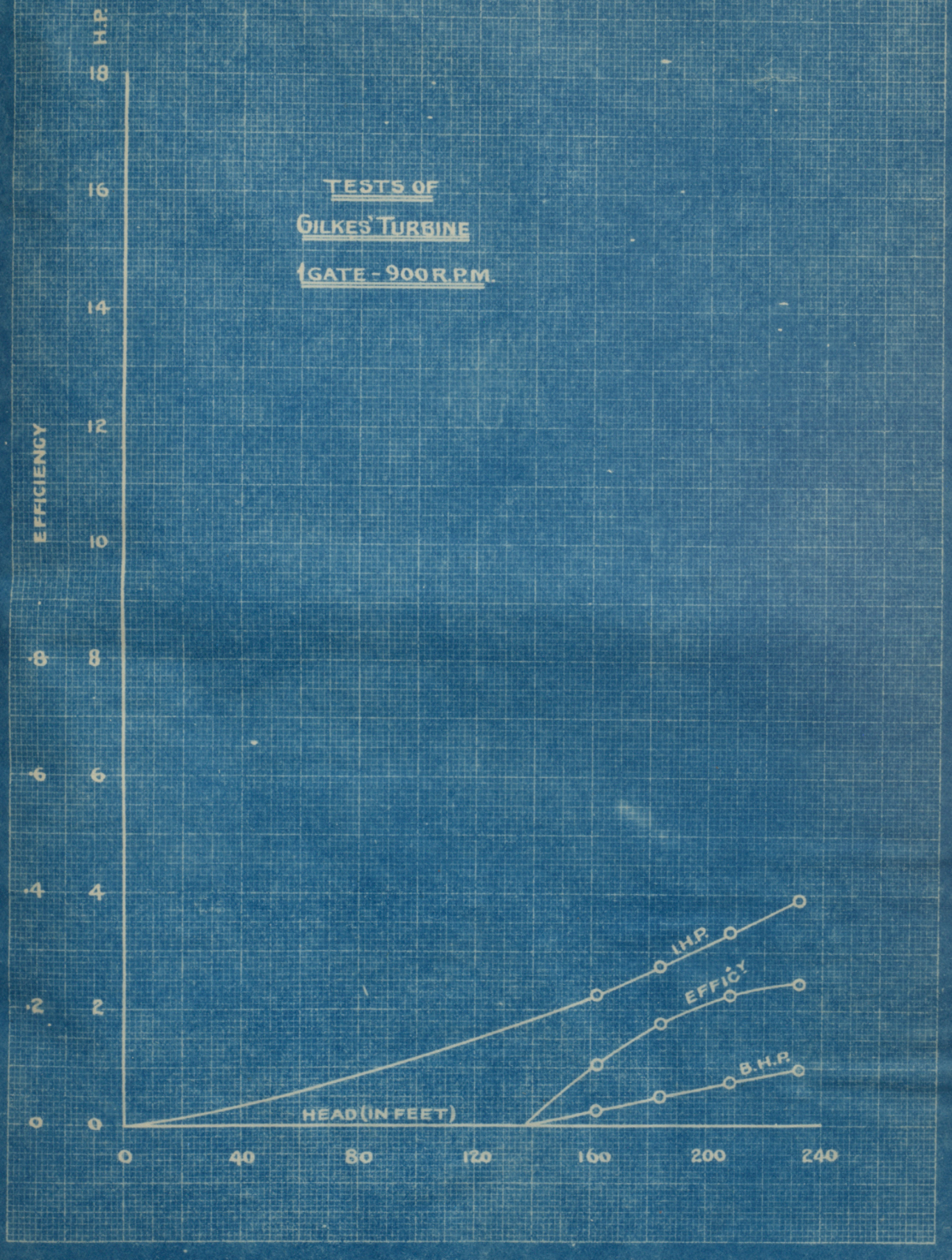
End of Set No XX.

DEPARTMENT OF ELECTRICAL ENGINEERING - MC GILL UNIVERSITY.

THIS MARGIN RESERVED FOR BINDING. IF SHEET IS READ THE OTHER WAY (VERTICALLY), THIS MUST BE LEFT-HAND SIDE.

TESTS OF GILKES' TURBINE

1 GATE - 900 R.P.M.



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HYDRAULIC LABORATORY.

Montreal, Feb 6th 1904

est of Silkes Turbine

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
3·47·30	Tank #2			2.3	80	0
·49·30	57.5			2.3	80	
·51·30				2.4	80	
·53·30	Tank #5			2.3	80	
55·30	336.8			—	80	7975
	394.3					

Test No. 202

Average Pressure } 80 lbs./□"

Equivalent Head; Corrected } 184.25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 2.76

Average effective brake pull (T_1-T_2) } 2.32 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 997

B.H.P. = $\frac{\pi \times \text{Eff. pull x Eff. diam. x R.P.M.}}{33000}$

= .336

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 12.15 %

emarks:

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□")	Counter — No. of Rev'ns
3·57	Tank #2			4.0	90	0
·59	117			4.0	90	
4·01				4.4	90	
·03	Tank #5			4.0	90	
·05	305.9			—	90	7980
	422.9					

Test No. 203

Average Pressure } 90 lbs./□"

Equivalent Head; Corrected } 208.25 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 3.34

Average effective brake pull (T_1-T_2) } 4.1 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 997.5

B.H.P. = $\frac{\pi \times \text{Eff. pull x Eff. diam. x R.P.M.}}{33000}$

= .594

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 17.8 %

emarks:

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HYDRAULIC LABORATORY.

Montreal, Feb 6th 1904

est of Gilkes Turbine

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns
4.08	Tank #2			6.1	100	0
.10	253			6.1	100	
.12				5.9	100	
.14	Tank #5			5.8	100	
.16	192			—	100	7980
	447					

Test No. 204

Average Pressure } 100 lbs./□″

Equivalent Head; Corrected } 231.75 ft.

Total time 480 secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

= 3.92

Average effective brake pull (T_1-T_2) } 5.98 lbs.

Effective diam'r of brake wheel } 1.528 ft.

Average R. P. M. 997.8

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

= .865

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = 22.1 %

emarks:

End of Set No. XXI.

TIME	Amount of Water Used (gallons)	BRAKE READINGS (lbs.) T_1	T_2	T_1-T_2	Pressure by Gauge (lbs./□″)	Counter — No. of Rev'ns

Test No.

Average Pressure } lbs./□″

Equivalent Head; Corrected } ft.

Total time secs.

I. H. P. = $\frac{\text{Head x pounds water used.}}{\text{Time in secs. x 550.}}$

=

Average effective brake pull (T_1-T_2) } lbs.

Effective diam'r of brake wheel } ft.

Average R. P. M.

B.H.P. = $\frac{\pi \times \text{Eff. pull} \times \text{Eff. diam.} \times \text{R.P.M.}}{33000}$

=

Efficiency = $\frac{\text{B.H.P.}}{\text{I. H. P.}}$ = %

emarks:

THIS MARGIN RESERVED FOR BINDING

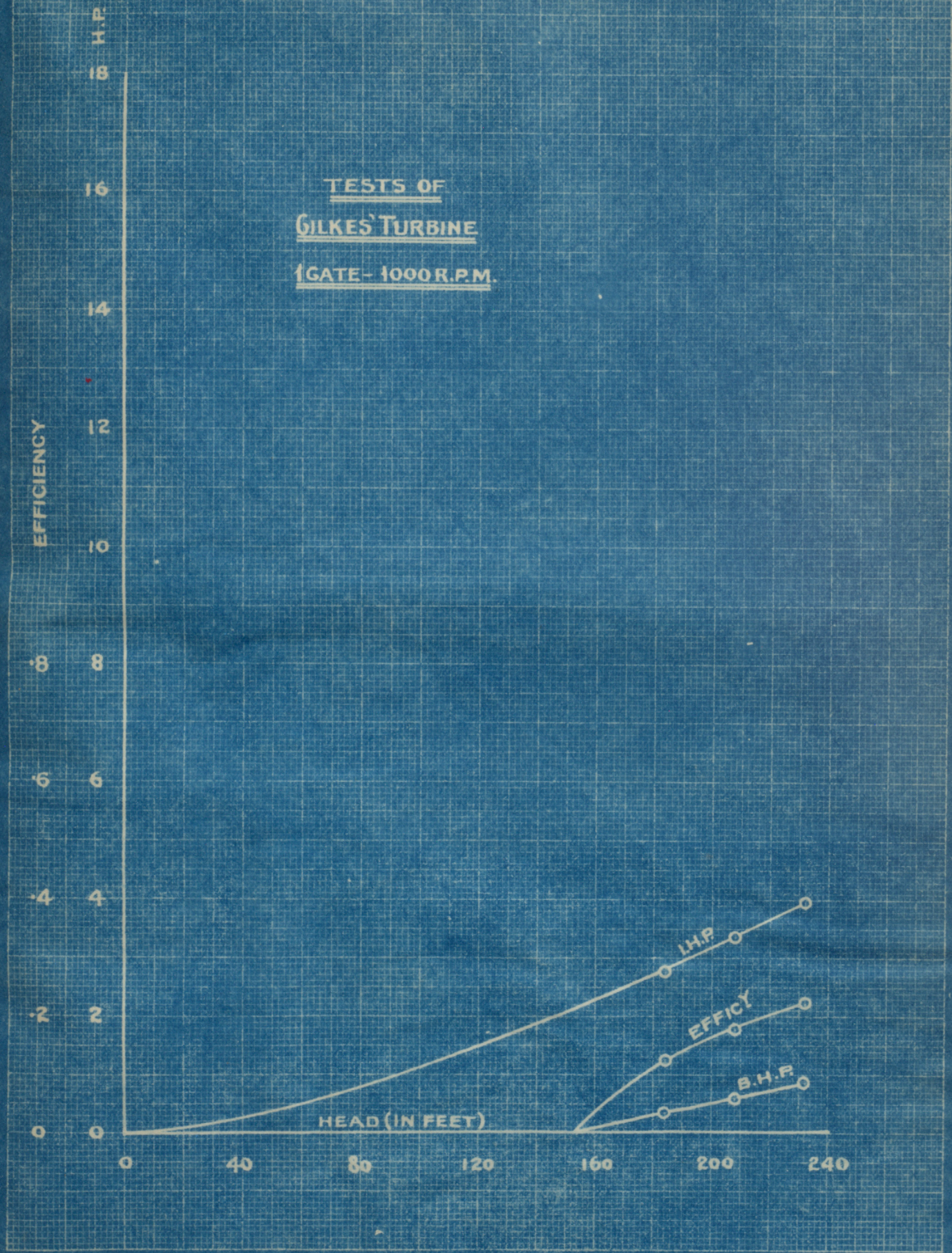
DEPARTMENT OF ELECTRICAL ENGINEERING--MC GILL UNIVERSITY.

THIS MARGIN RESERVED FOR BINDING.

IF SHEET IS READ THE OTHER WAY (VERTICALLY), THIS MUST BE LEFT-HAND SIDE.

TESTS OF GILKES' TURBINE

1 GATE - 1000 R.P.M.



CURVES OF

EFFICIENCY, B.H.P. & I.H.P.

ON

SPEED (R.P.M.) BASE

ONE GATE OPEN

QUERIES OF

MEMBERSHIP, B.H.P. & I.H.P.

ON

SPEED (R.P.M.) BASED

OUR GAUGE OPEN

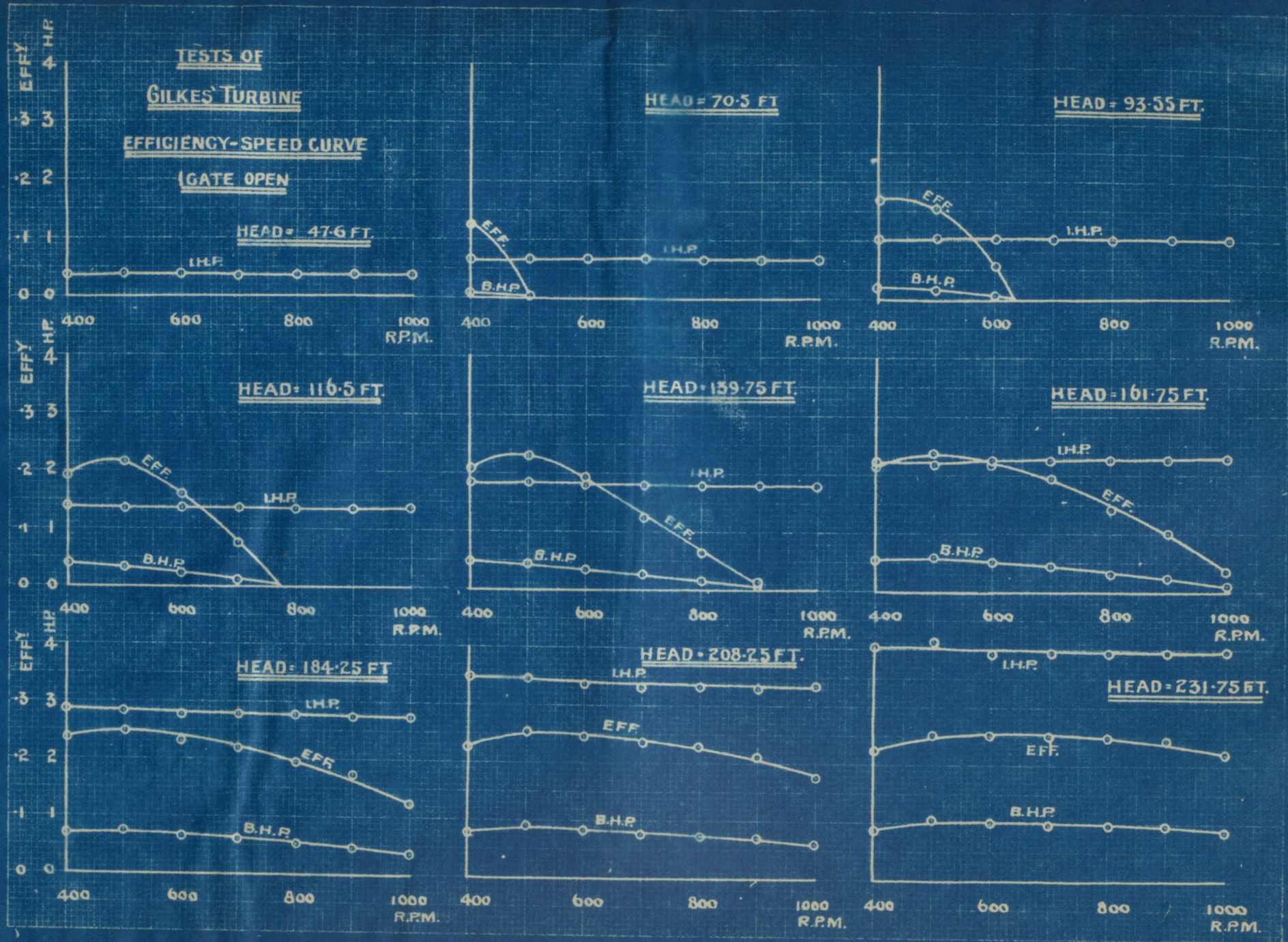
THIS MARGIN RESERVED FOR BINDING.

IF SHEET IS READ THE OTHER WAY (VERTICALLY) THIS MUST BE LEFT-HAND SIDE.

TESTS OF GILKES' TURBINE

EFFICIENCY-SPEED CURVE

GATE OPEN



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